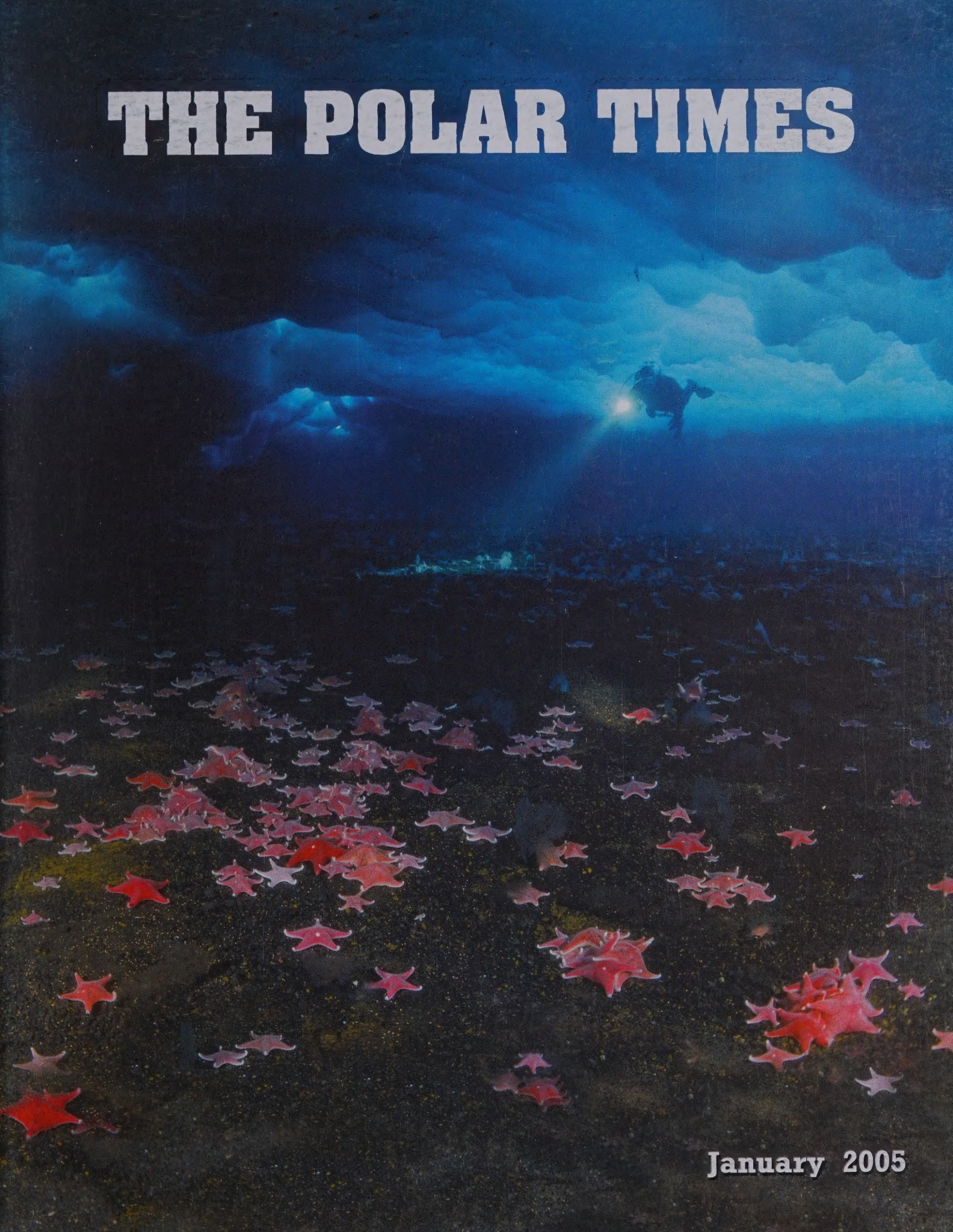
THE POLAR TIMES



January 2005

The late Galen Rowell's photo of a muskox skeleton illustrates the importance of nutrients leaching from decades-old bones to the thin mantle of plant life in Peary Land.

The Polar Times

American Polar Society

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The Polar Times

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ABOUT OUR FRONT COVER

A sample of the stunning photographs found in ***Under Antarctic Ice: The Photographs of Norbert Wu***, with text by Jim Mastro. See our review on page 11 of this issue.

The President's Letter

Because of the message given in each issue of *The Polar Times* in the small box on the inside back cover titled "Purpose of APS," I want to say a few words about the role the American Polar Society plays in research, as stated there several times. The polar world currently is about as active as, if not more so than, the recent Presidential election, although without the mud-slinging. Things are happening, some of it related to the planning for the next International Polar Year, 2007-2008. Both the Arctic and the Antarctica are again major targets for studies. Committees from several countries are actively soliciting topics for study from scientists and others in order to select and prioritize major efforts. It will be interesting to see how the final agenda is budgeted and implemented for this anniversary of Polar Years.

News about the polar regions comes to us in a variety of media, whether it be television, radio, newspapers, magazines, or technical journals. Some recent events that came my way included Arctic warming; Arctic Ocean sea-bottom territorial rights; China's major move in Antarctica to construct a station at Dome A (*Science*, 29 October); difficult ice impacting supply of McMurdo in 2004-05 season (*Science*, 22 October); a new agenda by SCAR to focus on five interdisciplinary themes (*Science*, 22 October and www.scar.org); Lake Vostok, a continuing effort on plans to drill the final column of ice over the lake and sample the water and sediments (*Popular Science,* November); and Richard Alley's article in *Scientific American* (November) on climate change.

The theme of several of the above items points to the increasing emphasis on informing the public about global warming—whether it is here or not—and, as Alley points out, the abruptness of past changes and the likelihood of the same in future. Many thanks to our contributors to *The Polar Times* for sending news accounts to the editors, who have elaborated on some of the above, elsewhere in this issue.

Whether or not one is a believer about global warming, there would seem to be little doubt that human intervention with what might have been natural climatic cycles in the geologic past has enhanced the process in the present. Lonnie and Ellen-Mosley Thompson's studies on glaciers worldwide have resulted in predictions that some glaciers are on the way out, with some due for extinction within decades.

I'm not really on a soapbox, but instead am pointing out what is happening in the parts of the world that have lured us into joining the Society. As our "purpose" states, one of our roles is to "disseminate information about polar regions." In addition to the above news items, we have also included herein book reviews, obituaries, and reports from APS officers. Our Membership Chair, Charles Lagerbom, reports considerable action with new members—particularly lifetime—so we think we are doing something right. Gift memberships for your friends are always a good way to show them the importance of a subject with which many of us members have already had a lifetime relationship. We are discussing a reward policy for members who recruit new members, consisting of a Life Membership for anyone who brings in a certain number of new members. Particulars will follow in the next issue.

In closing, I need to correct a statement I made last issue about Ellen-Mosley Thompson and her election as a Fellow to AGU. I erred regarding the society. She is a Fellow of the American Association for the Advancement of Science (AAAS); her husband, Lonnie, is a Fellow of AGU. ❑

John Splettstoesser

President
American Polar Society

A million penguins can't be wrong! Subscribe to *The Polar Times* today!

Due South

By Jeff Rubin, Antarctic Editor

A RARE Reunion

An under-appreciated American expedition to Antarctica from the first half of the 20th century recently got some long-overdue attention—thanks to a Texas connection.

The Ronne Antarctic Research Expedition (RARE) of 1947-48, led by Norwegian-American Cdr Finn Ronne USNR, was the last large private expedition to Antarctica. It explored both coasts of the Antarctic Peninsula and the Weddell Sea's southern coast, both on the ground and with three ski-equipped aircraft loaned by the U.S. Army Air Force.

Among the expedition's 23 members were the first women ever to winter in Antarctica: Jackie Ronne, wife of the expedition leader, and Jennie Darlington, wife of pilot Harry Darlington. The women had not planned to participate in the expedition, but at the last minute Finn Ronne asked his wife to come along to write its newspaper dispatches and other records. Jennie Darlington, asked to join as well, became pregnant during the expedition and might have given birth to the first native Antarctican had the expedition been forced to stay another year in the Antarctic, a real possibility if two U.S. Navy icebreakers had not arrived to free the expedition's beset ship. (Incredibly, no other woman wintered in Antarctica for another 27 years—until biologists Mary Alice McWhinnie and Sister Mary Odile Cahoon wintered at McMurdo in 1974.)

The Ronne expedition achieved a great deal, exploring more than 250,000 square miles of Antarctica. By overflying the Antarctic continent's, and the world's, last major stretch of unexplored coast, along the Weddell Sea from the Antarctic Peninsula to Coats Land, the expedition determined that the Weddell and Ross seas were not connected.

In 346 hours of flight time, including 86 landings in the field, RARE took nearly 14,000 photographs covering 450,000 square miles, crucially, with ground control. These achievements are even more impressive considering its relatively-limited budget of less than $50,000, far smaller than many expeditions of its era.

The expedition sailed from Beaumont, Texas on Jan. 25, 1947 in a 1200-ton diesel-powered wooden Navy tug (renamed *Port of Beaumont*). A local Eagle Scout, Arthur Owen, was selected to join the expedition. A full and productive member of the team, he went on to become a geologist.

The recent reunion came about when a Beaumont Boy Scout group, seeking role models for its current generation of Scouts, began investigating its past to find examples of Scouts who had gone on to leadership positions in life.

Art Owen's name came up, and the rest is history—or, I should say, a rediscovery of local history that had been lost.

Although Beaumont turned out in droves to send the Ronne expedition off to The Ice, the expedition returned to the States on April 15, 1948—but to New York, not Beaumont.

So the town had to wait 57 years to hold its homecoming party for the expedition.

When the Boy Scouts learned about their local connection to the expedition, things got moving—particularly when Beaumont philanthropist and historian David W. Hearn, Jr. got involved.

Mr. Hearn, owner of the 24,000-square-foot Clifton Steamboat Museum of local history, organized an extensive exhibition on the Ronne expedition, with artefacts donated or loaned by surviving RARE members, including the U.S. flag that flew over the expedition's base at Stonington Island. He also underwrote the digitization and preservation of more than 16,000 feet of motion picture film from the expedition, which will be shown at the museum over the next few months.

Photo by Brandon Gouthier

David Hearn, Jr., owner of Clifton Steamboat Museum, with Jackie Ronne, one of first women to winter in Antarctica.

> *... the town had to wait 57 years to hold its homecoming party for the expedition.*

The reunion, held on November 11, 2004, attracted three of RARE's six surviving members—Jackie Ronnie, geologist/surveyor Robert Dodson and Chilean mess cook Jorge de Giorgio Valdes; the others are Jennie Darlington, ship's mate/navigator Walter Smith, and radio operator Lawrence Kelsey.

Several hundred local people also attended, including some who had farewelled the expedition when it sailed down the Neches River in January 1947.

"They put on quite a pageant," Robert Dodson told me. "It was quite well organized."

Beaumont Mayor Evelyn Lord presided over much of the ceremony and even gave the three RARE members in attendance the keys to the city.

Jackie Ronne took the opportunity to thank local organizations who had supported the expedition in 1947 when it struggled valiantly to raise the funds to depart. She presented each of the groups with a framed plaque commemorating their vital assistance.

Perhaps most importantly, Mr. Hearn financed the publication of Jackie Ronne's book, *Antarctica's First Lady*, which was released in a book-signing at the Clifton Steamboat Museum.

The 407-page softcover is well-illustrated with more than 80 black-and-white photographs, a good many of them reproduced at half-page size, and many never before published.

Co-published by the Clifton Steamboat Museum and the Three Rivers Council #578 of the Boy Scouts of America, the book costs $25 (including shipping and handling). Send payment to: Three Rivers Council, 4650 Cardinal Drive, Beaumont, TX 77705.

For more information—and to see dozens of expedition photos provided through the generosity of the Ronne family—check out the Three Rivers Council's website at www.3riversbsa.org. ❑

Firefighting Is Different When Water Freezes in Seconds

by Capt. Ray Thomas, Antarctic Fire Department

EDITOR'S NOTE: This story has been edited for space.

***Special to Firehouse.Com News*, 13 February 2004**—McMurdo's Antarctic Fire Department is the continent's only organized full-time dedicated fire department. AFD is tasked with providing fire, EMS, hazardous material and aircraft crash rescue response for the U.S. Antarctic Program. AFD operates in two different seasons—summer and winter—both with different requirements. AFD also supplies equipment and training to members of the Amundsen-Scott South Pole Station volunteer fire brigade.

'Main Body' announces the end of a long, sunless winter and the beginning of a busy summer.

Winter-Fly, or "Winfly," is the start of season for AFD personnel as the department increases in size and responsibility when contract firefighters begin arriving. As many as ten additional firefighters arrive on the first flight in early September to help staff the airfield as more flights arrive. Winfly firefighters are tasked with preparing for "Main Body" in October.

Main Body announces the end of a long, sunless winter and the beginning of a busy summer. It all ends again in March as winter approaches and all but a hearty few go home, leaving a small detachment of firefighters, construction workers and support staff behind.

It all ends again in March as winter approaches and all but a hearty few go home.

The fire department is at full summer staffing with 42 people operating two full-time stations: Station 1 in McMurdo and Station 2 at one of two seasonal airfields. All station personnel work a 24-hour-on, 24-hour-off schedule. Four dispatchers work 12-hour shifts.

A winter-over crew of ten firefighters, two lieutenants, one dispatcher and one captain staff Station 1 during the long winter, when Station 2 is closed.

Station 1 operates two Class A, 750-gallon Pierce Arrow fire engines, one 3000-gallon water tender and one ALS ambulance with one engine in reserve. Station 1 responds to emergency calls in McMurdo proper and mutual aid to New Zealand's Scott Base. Calls for service range from fires, fire alarms, fire inspections, medical calls and hazardous material spills.

Public service calls are a norm for the members of AFD, ranging from hanging the parachute in the gymnasium for social events, to helping move furniture, to volunteering to wash dishes during the Christmas or Thanksgiving dinners.

Firefighters working out of Station 2 at the airfields use tracked firefighting vehicles instead of wheeled apparatus. Two kinds of suppression systems are used at the airfield: water/foam and chemical powder. Two center-articulated, tracked fire trucks/crash rigs carry 1,200 gallons each of water/protein foam in special heated tanks. Smaller lightweight tracked vehicles carry chemical powder and water/foam.

At mid-summer in December, the sea ice runway becomes unusable, so air operations move to one of two other airfields located around McMurdo. Willy Field, a snow packed skiway, is the hub of LC-130 flights. Station 2, runway tower, galley and all support vehicles and buildings are then physically moved from the ice runway to Willy Field. The fire station and buildings are built on large skis and pulled from one location to the next. Pegasus Field, 18 miles away, is built on a freshwater glacier that extends into McMurdo Sound. Staffing at Pegasus' 10,000-foot runway is only on a per-flight basis at this time.

Resupplying AFD is an art. Because all heavy equipment has to be shipped by sea, a minimum of two years is needed to get new equipment.

Fresh water is at a premium since all the water is produced from seawater by reverse osmosis. Frugality and swiftness are key when attacking a fire here. Water supplies are limited and slow to replace.

Great care must be used by firefighters when conducting even routine jobs. Hands will freeze to an aluminum ladder rung if a glove is accidentally lost.

Slips and falls are the most frequent incident calls to which AFD responds. Cleated shoe attachments are issued to anyone on request. Firefighters have been known to screw sheet metal screws into the soles of their boots, or to wear boots two to three times larger than normal and fill them with extra insulation. Almost everyone who has been here before has a pocket on their turnout gear dedicated to nothing but extreme cold weather (ECW) gear; wool cap, gloves, face cover, goggles and chemical hand warmer packs.

Department members assigned to Station 2 at Willy Field have a special bond with the pilots of the 109th New York Air National Guard. The U.S. Air Force requires that all landings and takeoffs at the Ice Runway, Pegasus Field or Willy Field be covered with one or sometimes two fire-fighting vehicles. At Willy Field, the taxiway passes right by where we set up for these landings and takeoffs.

Due to pure boredom, the firefighters have begun judging the landings of the LC-130 pilots.

Due to pure boredom, the firefighters have begun judging the landings of the LC-130 pilots. As the planes pass this position, firefighters hold up signs indicating the scoring for their landing. Pilots are judged on evenness of decent on their final approach; how softly they touch down; and if they can land close to the taxiway and slow quickly enough to turn off onto the taxiway without passing it. Scores range from twos and threes to nines and tens.

Other signs read: "Where is my mail?," "My blind grandmom could have done that better," or "Ouch!" An occasional centerfold is held up.

Pilots have also been known to show their own signs like "Nice wheels, Grandma!" or "How you going to get home?" Pilots who scored poorly have even sent their loadmasters with bribes in an attempt to get better scores. Fresh milk and special entertainment magazines are readily accepted and do a great deal to improve scores.

The control tower is even in on it, wanting to know what signs we will hold up. Just the other day, I was out at Station 2, and a pilot landed, reversed his props, slowed as fast as he could but overshot the taxiway and had to turn around to get back. The air traffic controller came up on our radio and told us that the pilot just radioed and knew that he had lost a lot of points with the overshoot. When the plane passed our position he just hung his head and the other members of his flight crew made sure that we knew who was piloting.

Frugality and swiftness are key when attacking a fire here. Water supplies are limited and slow to replace.

One duty that a firefighter assigned to Station 2 will face is dealing with wildlife on the runways. During the summer months it is not unusual to have Adélie or emperor penguins wander onto the runways. Weddell seals have even shown up from time to time. ❑

Glaciers Surge When Ice Shelf Breaks Up

***NASA News*, 21 September 2004**—Since 2002, when the Larsen B ice shelf broke away from the coast of the Antarctic Peninsula, scientists have witnessed profound increases in the flow of nearby glaciers into the Weddell Sea. These observations were made possible through satellite data.

Two NASA-funded reports, appearing in the *Geophysical Research Letters* journal, used different techniques to arrive at similar results. Researchers said the findings prove ice shelves act as "brakes" on the glaciers that flow into them. The results also suggest climate warming can rapidly lead to rises in sea level. Large ice shelves in the Antarctic Peninsula disintegrated in 1995 and 2002, as a result of climate warming.

Almost immediately after the 2002 Larsen B ice shelf collapse, researchers observed nearby glaciers flowing up to eight times faster than prior to the breakup. The speed-up also caused glacier elevations to drop, lowering them by as much as 38 meters (124 feet) in six months.

"Glaciers in the Antarctic Peninsula accelerated in response to the removal of the Larsen B ice shelf," said Eric Rignot, lead author of one of the studies. "These two papers clearly illustrate, for the first time, the relationship between ice shelf collapses caused by climate warming, and accelerated glacier flow."

Said glaciologist Ted Scambos, lead author of the second study: "If anyone was waiting to find out whether Antarctica would respond quickly to climate warming, I think the answer is yes. We've seen 150 miles of coastline change drastically in just 15 years."

The papers illustrate relationships between climate change, ice shelf breakup and increased flow of ice from glaciers into oceans. Increased flow of land ice into oceans contributes to sea level rise. While the Larsen area glaciers are too small to significantly affect sea level, they offer insight into what will happen when climate change spreads to regions farther south, where glaciers are much larger. ❑

Antarctic Ice Station Likely To Float Away

***Reuters*, LONDON, England, 28 June 2004**—Britain's Antarctic ice station has a design problem few architects can have envisaged when it was built—within a decade it is likely to float away.

The existing base is built on an ice shelf which is likely to break off into the sea if global warming continues at its current rate.

So now the British Antarctic Survey (BAS) has appealed for designers to come up with a replacement.

Not only will the new $35 million (£19 million) station have to be able to operate throughout the year in one of the world's most inhospitable environments, it will have to be environmentally neutral and aesthetically inspiring.

So strict are the environmental rules governing Antarctica that all refuse—including human waste—is supposed to be bagged up and shipped out so no lasting trace is left of outside occupation.

"This is an ambitious project," said BAS director Chris Rapley. "It will be a fusion of science, architecture, technology and engineering."

The new station will replace BAS' existing Halley facility on the Brunt ice shelf which is expected to follow much of the ice-bound continent's sea ice and break away as the world's climate warms.

> *Britain's Antarctic ice station has a design problem ... within a decade it is likely to float away.*

The existing Halley station is the fifth to be built on the Brunt shelf since 1956 to study changing weather patterns.

Unlike its predecessors which have simply been swallowed by the ice, the current Halley is on stilts and is jacked up each year to avoid being submerged by snow.

A BAS spokeswoman said the new station, scheduled to be operational by November 2008—in time for the 2008/2009 southern hemisphere summer when the staff quadruples to 60—would probably be built on the remains of the Brunt shelf.

But it will be sited on the landward side of the expected crack in the shelf, rather than on solid ground.

"It is a relatively simple matter to resupply a station by sea if it is on the ice shelf. Siting it inland on solid ground would mean resupply by air which is astronomically expensive," the spokeswoman said.

The new station will not only have to cope with temperatures of -30 degrees Celsius (-22 Fahrenheit) and howling gales, but will also have to be able literally to rise above the regular snowfalls.

A shortlist of design teams expressing an interest by August 3 will be asked to submit concept proposals to the Royal Institute of British Architects, and a winner will be named in September 2005. ❑

Cold War Erupts Over Lake Vostok

***Cox News Service*, ST. PETERSBURG, Russia, 28 November 2004, by Sabra Ayres**—Russian and American scientists are engaged in a new Cold War of sorts over Lake Vostok, a subglacial body of water the size of Lake Ontario. A Russian team of researchers is determined to be the first to drill to Lake Vostok's surface.

But a group of American and international scientists contends that the Russian drilling method may spoil the project and contaminate the findings. The Russians insist their plan is clean and they will proceed next month with drilling to reach the lake. The lake's surface could be reached as early as next year. The Russians say they have followed all the rules set out under international treaties governing research and environmental protection of the icy continent.

The dispute is simply grounded in the competition, said Valery Lukin, the head of the Russian Arctic and Antarctic Research Institute in St. Petersburg. The Russian team, headed by Lukin, will employ a drill rig that uses kerosene to prevent the hole from re-freezing as the drill bit punctures through the ice to the lake's surface.

Opponents say that the Russians' water samples from the lake will be spoiled by contact with the kerosene mixture. They have urged the Russians to hold off until a better method can be developed through a consortium of international experts.

"The ramifications of contamination would be immense," John Priscu, a geomicrobiologist from Montana State University.

The Russian drilling technique would use atmospheric pressure to draw the lake's water out of the drill hole once scientists puncture to the lake's surface. The pressure differential would force water from the lake up the hole like gas through a siphon hose.

The kerosene would not mix with the water, but instead act as a plug moving upward through the drill hole as the lake water jets to the surface, Lukin said.

But some believe the water will freeze on the ice sheet, ruining the scientific value of the sample. ❑

Polarstern Drifting in Antarctic Ice

***Alfred Wegener Institut* press release, 9 December 2004**—Since 27 November, an ice floe has served as home as well as working place for 55 scientists from 11 nations. The research icebreaker *Polarstern* of the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven, Germany, has been tied up firmly to a drifting ice floe in the Antarctic Weddel Sea.

As part of the expedition "Ispol" (Ice Station POLarstern), the floe is the object of a several-week investigation by glaciologists, biologists, oceanographers and meteorologists. The area of investigation represents a unique ocean region in that it has the largest percentage of perennial sea ice in the Southern Ocean.

Floe dimensions are roughly four by four kilometres. It consists of numerous impressive pack-ice ridges, as well as several planes with approximately half metre snow cover. The ice layer below is between one and more than two metres thick. On the ice floe, "streets" have been flagged to be used by commuting skidoos supplying the various working sites with equipment and personnel.

"Arrived! Finally—after four years of preparation!" exults Dr. Gerhard Dieckmann of the Alfred Wegener Institute, one of the "Ispol" initiators.

On the "Ispol" website (www.ispol.de), the expedition can be followed through a detailed expedition log, and images from the site provide an impression of the work on the ice.

Polarstern is expected back in Bremerhaven on June 17. ❑

Antarctic Glaciers Quicken Pace to Sea; Warming is Cited

***New York Times*, 24 September 2004, by Andrew C. Revkin**—Spurred by warming coastal air and waters, some of Antarctica's glaciers have accelerated their seaward march, fresh observations show, suggesting that ocean levels might be irreversibly on the rise for centuries to come.

Global warming from smokestack and tailpipe emissions of heat-trapping gases could well be contributing to the changes, but some of what is happening is probably a delayed reaction to the long warm-up since the last ice age, glaciologists said yesterday.

Over all, Antarctica still holds a mix of conditions, with some spots cooling and others warming, but the new observations, described this week in three scientific papers, confirm that warming along the coast, as it causes fringes of ice to melt, can release larger ice sheets to flow faster to the ocean, where they will inevitably melt.

The changes were detected by separate satellite and aircraft surveys of small glaciers along the east side of the Antarctic Peninsula, the rugged, sharply warming arm reaching toward South America, and along giant ice sheets feeding into the Amundsen Sea.

In each place, the removal or weakening of fringing shelves of ice attached to the shore or seabed in front of the glaciers appears to have liberated the great inland ice sheets.

Similar shifts have been measured in some glaciers in Greenland, with erosion of "tongues" of ice protruding into the sea causing inland ice sheets to flow more quickly to the sea.

Even with the acceleration, the potential rise in seas in this century would probably remain within the range estimated by the main international panel studying global warming, perhaps two feet or so, said some of the scientists monitoring Antarctica.

That change already constitutes a slow-motion catastrophe for places like Bangladesh, New Orleans and low island nations, experts say. But the findings add weight to the idea that rising seas could be a fact of life for centuries to come, requiring serious reassessments of the human penchant for living along coasts.

In a paper published in the September online edition of the journal *Science*, one team said the *vast* glaciers flowing into the Amundsen Sea were thinning twice as fast near the coast as they had in the 1990's.

This is important because these glaciers help drain the West Antarctic Ice Sheet, a region containing enough ice to raise sea levels 20 feet.

The changes in these glaciers could be a delayed response to the departure of coastal Ice shelves there in the prolonged warming since the last ice age, experts not associated with the study said. But the speed-up could also have been affected by recent further warming of the air and seas in the western Antarctic, some of which is probably linked to warming of the global climate from gas emissions, independent experts and study authors said.

Warmer sea water erodes the bond between coastal ice and the bedrock below," like weakening the cork in a bottle," said Dr. Robert H. Thomas, a glacier expert for NASA in Wallops Island, Va., the lead author of the Science paper. "You start to let stuff out."

A pair of papers published this week in the journal *Geophysical Research Letters* described strong additional evidence that coastal changes can speed the flow of inland glaciers, focusing an the east coast of the Antarctic Peninsula.

That region captured worldwide attention in 2002 when the floating Larsen B ice shelf, the size of Rhode Island and locked to the shore since the last ice age, abruptly disintegrated into a constellation of icebergs.

In subsequent flights over inland glaciers, American and Argentine scientists measured a two-fold to six-fold increase in their speed in the following months, the researchers said. Satellite measurements showed some glaciers there slumped as much as 100 feet over the same span.

Adjacent glaciers not fronted by the departed shelf did not react, providing something rare in earth science, the equivalent of a case-control study, said Dr. Theodore A. Scambos, lead author of one of the papers on the changes along the peninsula and a glaciologist at the National Snow and Ice Data Center in Boulder, Colo.

Dr. Richard B. Alley, an expert on Antarctica at Pennsylvania State University who was not involved but is familiar with the findings, said the studies were cause for concern and justified a much more intensive survey of the world's thawing places.

In the best case, Dr. Alley said, there could be a short-term rise in sea levels that would stop as new fringing ice shelves eventually put the brakes on the glaciers. But it was also possible that conditions would set off "complete or near-complete collapse over centuries or millennia," he said, guaranteeing a steady flooding of coastlines far into the future. ❑

Hillary Opposed to Highway to South Pole

***Associated Press*, WELLINGTON, New Zealand, 29 November 2004**—New Zealander Sir Edmund Hillary, the first man to climb Mount Everest and the first to drive a vehicle to the South Pole, described a U.S. highway to the pole as "terrible."

Work on the 1,020-mile "ice highway" from the Antarctic coast south of New Zealand to the South Pole is currently in its third season.

The project will enable hundreds of tons of supplies and equipment to be hauled across the world's most inhospitable wilderness to Amundsen-Scott Base, a U.S. research station. It's planned for completion by the end of the 2006 polar summer.

Currently, cargo planes fly in scientists and supplies during the four-month summer.

Hillary, who's revisiting Antarctica this week, was blunt about the project: "I think it's terrible," according to local media reports.

New Zealand Foreign Minister Phil Goff said the road is environmentally acceptable, but he understood Hillary's objections to the project.

"He spent weeks battling against the elements to get to the pole, and it was an enormous achievement," Goff said.

"Now you've got the concept of a marked route that takes away the challenge and the adventure of getting there, and that is anathema to Ed," he said.

Hillary led a small team 1,250 miles from New Zealand's Scott Base on the Antarctic coast to the South Pole by tractor as part of the first trans-Antarctic crossing in 1957. ❑

China Takes Bold Steps Into Antarctic's Forbidding Interior

Increased spending and ambitious plans for exploration aim to strengthen China's foothold in the polar regions

***Science,* BEIJING, 29 October 2004, by Yang Jianxiang**—Covered by the East Antarctic Ice Sheet, the Gamburtsevs are probably the least explored, and most poorly understood, mountain range in the world. It's not for lack of scientific interest: According to climate models, the 600-km-long Gamburtsev range is the likely birthplace of the ice sheet the formed some 30 million years ago, and the mountains hold important clues about geological and climactic forces in the region that have shaped global change over the eons. But their inaccessibility—thanks to a 1000-meter-thick blanket of ice combined with the harshest weather on the planet—has allowed them to retain vital geological secrets such as their age, composition and topography. Their very existence—a 3,600-meter-high formation far from the edge of any tectonic plate—is a major mystery.

A team of Chinese polar scientists recently set out on a journey to lift that veil of secrecy. It's the first step in a plan to build a permanent station at Dome A, the highest, driest, and coldest spot on the continent. Once the station is completed, in 2008, the scientists plan to outfit it with the instruments that can make use of those inhospitable conditions to gaze into the distant universe, monitor the polar upper atmosphere, extract ice cores, and drill through the ice sheet to the underlying bedrock.

Their 1,200-kilometer trek inland from China's Zhongshan station on the continent's east coast is part of the country's broader commitment to polar research that includes a new Arctic station, an expansion of its two existing Antarctic stations, an upgraded research ship, new support facilities, and ultimately a new home for its premier Polar Research Institute of China (PRIC) in Shanghai. Chinese officials hope that an extra $64 million over the next 3 years, doubling the current annual polar science budget of roughly $20 million, will also lift the country into the major leagues of polar research in time for the high-profile International Polar Year (IPY) in 2007 (*Science*, 5 March, p. 1458).

News of these ambitious plans, which has dribbled out over the past several months, has generated a buzz in the polar research community. "It's like manna from heaven," says Christopher Rapley, director of the British Antarctic Survey and chair of the IPY planning committee, who learned about the details earlier this month at an international conference in Beijing marking the 20th anniversary of China's firs scientific foray into the polar regions. "It's the biggest financial commitment to IPY to date from a government, and I hope that it will stimulate other countries to do the same."

Rightful Interests

Like most government-supported research in China, the value of polar research is seen in geopolitical as well as scientific terms. This summer, for example, President Hu Jingtao hailed the opening of China's first permanent arctic research station in Svalbard, Norway, by exclaiming that it "would open important windows to scientific exchange with other countries" as well as help discover "natural secrets that will benefit both current and future generations." The country's five-year plan for polar research justifies the station, called Yellow River, as a way "to enhance China's influence on issues concerning Arctic research and protect its rightful interests."

Those interests are quite broad. At the Beijing conference, PRIC Director Zhang Zhanhai described three overarching research themes that will drive China's efforts for the rest of the decade. One involves the Antarctic continent, including the construction of a Dome A station and installation of environmental monitoring systems throughout the vicinity, drilling into the Gamburtsevs, and exploring the variability of the coupled (air-sea-ice) climate system along the Amery Ice Shelf and throughout the Southern Ocean. A second then focuses on exploring various upper atmospheric phenomena, with scientists combining observations taken at the Zhongshan, Dome A, and Yellow River stations. The third examines the factors contributing to rapid climate change in the Arctic, making use of the new Svalbard station. Each activity is connected to an existing global polar initiative, says Zhang, who adds that China welcomes foreign collaborators on any and all projects.

> ***...to lift [the] veil of secrecy...[is] the first step in [China's] plan to build a permanent station at Dome A...***

The Gamburtsev drilling project is probably China's best bet to carve out a niche for itself in the polar regions. Most of the country's scientific work to date has been derivative, notes Dong Zhaoqian, the former director of PRIC, who led China's first Antarctic expedition in 1984. But the Gamburtsevs are virgin territory. Obtaining samples and doing on-the-ground measurements would be a real coup, say geologists. "It would be a big scientific advance," says Slawek Tulaczyk of the University of California, Santa Cruz, an expert on subglacial drilling.

The Chinese team faces formidable challenges, to be sure, beginning with the logistics of setting up and maintaining a station to support the multi-year effort. In contrast to the air support that's available to scientists working at the U.S. Amundsen-Scott Station at the South Pole, the Chinese team must lug all their equipment overland. And keeping the hydraulics and electronic equipment in working order during the brutal Antarctic winter won't be easy. But the drilling should be relatively straightforward, says Tulaczyk, aided by the technological advantages of going from cold ice to bedrock without passing through an intervening layer of water. "They're playing it smart," he adds, by picking a place where the ice is relatively thin.

A renovated polar research ship would also enhance China's ability to conduct all kinds of climate change studies. The *Snow Dragon* (*Xue Long* in Chinese), purchased from Russia in 1993, is China's first ship with ice-breaking capabilities. The spacious (167 meters long) ship is a real workhorse of the country's polar program, serving as both a supply vessel and a research platform. Xiaojun Yuan, a research scientist at Columbia University's Lamont-Doherty Earth Observatory in Palisades, New York, for example, has piggybacked on the ship's biannual visits to Zhongshan and China's Great Wall station on King George Island to take measurements of salinity and temperature in an understudied portion of the Southern Ocean. She hopes to get one more set of data this season from the project, funded jointly by China's Arctic and Antarctic Administration and the U.S. National Science Foundation, before the ship goes into dry dock. "It's filling a gap in the global picture of interannual sea variability," she says.

But its equipment dates from the 1980s, and the $20 million upgrade would give it a modern navigational system, more lab spaces, and the ability to accommodate two helicopters. At the same time, the government has pledged $20 million to provide a dedicated berth and warehouse facilities for the ship, and there is talk of eventually moving PRIC to the new site, too. There's also an effort to drum up support for a second research vessel, a domestically built ship that would be smaller and better suited to work in the open ocean. The additional funding is also expected to draw scientists into the field, a step that Rapley and others say is necessary if China hopes to take advantage of its improved scientific infrastructure. "This gives them the opportunity to really ramp up their capacity," he says. Jihong Cole-Dai, a geochemist at South Dakota State University who has worked with PRIC scientists on Antarctic ice cores, agrees that "they need more people" to broaden their work at the poles. But he predicts that "if the decision [to make polar research a priority] has been made, then the resources will be provided."

The increased support can't come soon enough for Chinese polar scientists. "Sometimes when foreign researchers talk about joint operations, we just shy away because we're unable to raise our share of the funds," says one scientist who requested anonymity. "But now I'm feeling more optimistic." ❑ ***Yang Jianxiang writes for* China Features *in Beijing. With reporting by Jeffrey Mervis***

Bugscicles

***Columbus Dispatch*, "Science," 21 September 2004, by Mike Lafferty—** The tiny Antarctic midge spends 22 months of its 24-month life encased in ice. If that's not bad enough, when the ice melts, the quarter-inch insect thaws and dries out. The process leaves it looking like a raisin—one you leave in the box.

"These things can lose 60 percent of their body water and come back from that," Ohio State University entomologist David Denlinger said.

The midges, which live on the coast near Palmer Station, also have to deal with copious amounts of nitrogen in the guano dumped on them from nearby nesting penguins.

"It's kind of amazing that something has figured out how to live there," Denlinger said.

The National Science Foundation is curious about how the midge does it, too. The foundation is funding a $1 million, three-year study so Denlinger and Miami University zoologist Richard Lee can learn how this oft-frozen, shriveled-up, wingless bug can survive almost everything Mother Nature throws at it and how that knowledge can apply to insect control and even medicine.

"It can survive being frozen internally. You can dry it out .... It looks dead for all the world and then when you add water, it plumps back up and wiggles away," said Lee, who has collaborated with Denlinger on other investigations.

These midges can lose 60 percent of their body water and come back.

Denlinger and Lee will travel in December to Antarctica to begin work They will start their studies in labs at Palmer Station then bring back specimens to a cold room at Ohio State.

Their study will be the first serious investigation of this super bug—improbably, the continent's largest land animal. (Biologists don't count penguins because they also inhabit the ocean.)

"Some organisms can adapt to one or two stresses, but this organism can handle many," said Marie Bundy, an ecologist in the National Science Foundation's Office of Polar Programs.

The midge—its scientific name is *Belgica antarctica*—can survive conditions that range from the very acidic to very alkaline.

It gets weirder: Lee once sealed some midges in an air-tight container for a month; when he opened the container, the insects were still alive.

"They tolerate freshwater (and) salt water to two times the strength of normal salt water," Lee said.

Midges and gnats are common names for a large number of small, non-biting flies. While most end up food for fish and birds, the trade-off to the Antarctic midge's harsh environment is that it appears to have no predators.

It spends its life on the ground, usually on mats of algae that form near the shore.

Belgica antarctica is genetically linked to midges living on the tip of South America. It has prospered for millions of years, perhaps since when all the continents were joined.

Through the eons, insects evolved a variety of survival mechanisms to protect against cold.

For instance, many butterflies migrate, some flies hide inside houses, certain mosquitoes look for damp, dark spots to hibernate, and many other insects burrow into lake and river bottoms.

But the abilities of some insects to survive hostile conditions are truly extraordinary. Some caterpillars live at temperatures of minus 10 degrees Fahrenheit. In the 1960s, scientists discovered an African midge that could withstand submersion for five minutes in liquid helium—a temperature of minus 454 degrees Fahrenheit.

"How can something freeze and not be killed? That's a very interesting, pure science question," said George Yocum, a research physiologist and insect specialist at the U.S. Department of Agriculture's laboratory in Fargo, N.D.

The research has helped in the development of techniques to keep sperm and eggs frozen for artificial insemination.

And better knowledge of the midges' survival skills, Yocum said, could lead to better ways to store organs for transplantation and to improvements in insect control.

"Some insects actually freeze, hard as a rock," Yocum said. "Only a small fraction of insects can do that. They get ice inside their bodies."

By the 1990s, advances in genetics allowed entomologists to begin learning how insects cope with such extremes. In 1992, Denlinger discovered that insects survive cold weather in part by making proteins that enhance their tolerance of low temperature.

This is key for insects living in polar or alpine regions. They usually need several years to mature because there isn't enough warm weather in one summer to allow for such growth.

Most midges that live in temperate areas, such as Ohio, usually complete a life cycle in about 30 days. The Antarctic midge, however, needs two years.

Belgica antarctica live as larvae for most of their short lives. They survive in the ice, Denlinger believes, because the ice insulates them from harsher conditions outside.

In the summer, when the ice and snow melt, the larvae emerge to feed on algae and small, sparse grasses. A few weeks later, they're encased in ice again. After their second winter, they emerge again, develop into pupae and then into adults that quickly breed and reproduce.

Then the midge dies.

"The eggs hatch right away, and the larvae start the next cycle," Denlinger said.

Midges and other insects possess an internal clock that tells them when to enter diapause, which is similar to hibernation. At the same time, complex chemical systems allow insects to survive extreme temperature changes without freezing or drying out. Denlinger's work into how insects use this clock function has won him international renown.

Photo Courtesy Ohio State University

The Antarctic midge—a* real *"cold bug"

Because many insects enter diapause at some time during their life cycle, Denlinger hopes to figure out how to turn these mechanisms off and on. That could lead to manipulating insect populations.

"Rapid cold hardening allows insects to continuously fine-tune their physiological function and performance to match even modest temperature changes," Denlinger said.

Chemical factories inside many insects switch on before temperatures fall and begin making alcohol. In essence, they pickle themselves.

Insects also contain genes that switch on and direct the insect's cells to make heat-stress proteins that help them survive freezing temperatures and extreme dryness.

It looks dead ... and then when you add water, it plumps back up and wiggles away.

Belgica antarctica probably has similar genes, which are found in organisms from bacteria to primates.

"Even our bodies make these kinds of—proteins when we have a fever," Denlinger said.

But it's also possible the midge has something unique.

To figure that out, the researchers have to identify its survival genes.

Denlinger said he also is intrigued by the midge's black coloration and believes it may protect it from the intense ultraviolet radiation in Antarctica.

Even more cool, he said, would be if the insect has acquired immunity—picking up some sort of protection from the algae and grasses it consumes. ❑

New Zealanders Remember Antarctic Flight

Associated Press, **WELLINGTON, New Zealand, by Ray Lilley**—It was billed as the "flight of a lifetime"—an Air New Zealand DC10 cruising on a sightseeing tour over the pristine icy wilderness of Antarctica.

But the joy of the Nov. 28, 1979, trip turned to horror when the plane slammed into the side of an active Antarctic volcano—Mt. Erebus—killing all 257 on board in New Zealand's worst aviation disaster.

Now, 25 years after the crash that killed 200 New Zealanders, 24 Japanese, 22 Americans, six Britons, two Canadians, one Australian, one French national and one Swiss national, the man who led efforts to recover their bodies from the icy wasteland is still haunted by the carnage he saw.

"I think about it every day," police inspector Greg Gilpin told The Associated Press. "When you see ... the aircraft and the human destruction we saw there, you never forget it."

Erebus recovery worker Hugh Logan, now head of the nation's Department of Conservation, said all that was left was "a big black smear up the side of the mountain ... and the completeness of the devastation."

Among those who planned to attend a memorial ceremony below a commemorative cross on the slopes of Mt. Erebus was Sir Edmund Hillary, the climber best known for becoming the first man to conquer Everest.

Hillary, who also is the first man to drive a tractor to the South Pole, had been scheduled to act as a commentator on the ill-fated flight but was forced to pull out due to work commitments in the United States.

Back in New Zealand, the airline plans a special memorial church service in the northern city of Auckland.

An inquiry ruled that the disaster happened because Air New Zealand's Flight Operations Center changed coordinates on the plane's navigation computer without telling the crew.

That mix-up combined with whiteout conditions meant that the first the crew knew of the collision course they were on was when the plane's ground proximity warning system sounded in the cockpit, warning them to climb.

After 11 seconds calmly debating why they appeared to be so close to the ground and moving to climb, the plane slammed at full speed into the snow and ice-covered mountainside.

Whiteout occurs when high cloud blots out the sun and the bright light washes out landscape contrasts and shadows, destroying a pilot's perception of depth or distance.

The phenomenon makes it "impossible to perceive the boundary between land and cloud," former Air New Zealand pilot Gordon Vette said in his book "Impact Erebus."

Former air force squadron commander Bob Henderson, who flew three seasons in the Antarctic, said the Erebus disaster "heightened the awareness of this (phenomenon) as a risk ... as a threat," and "people became more aware this could be a significant issue" for fliers.

The airliner's impact was so powerful that, in the days before DNA testing, the remains of 44 of the victims were never identified.

Air New Zealand scrapped Antarctic flights that day, and the carrier has never been back.

"Air New Zealand has no plans to resume sightseeing flights to Antarctica," corporate communications manager Mike Tod said. ❑

Penguins Face Starvation Threat

BBC Online, **16 December 2004**—Tens of thousands of Antarctic penguin chicks could starve because an iceberg is blocking their parents' access to coastal feeding grounds, officials say.

Adelie penguins on Cape Royds face a 180-km (112-mile) round trip in the coming weeks to bring food to chicks, New Zealand government scientists say.

This means that most of the chicks will probably die, though the colony will almost certainly survive, they add.

The scientists say the iceberg is the biggest floating object in the world.

The 3,000 sq-km (1,200 sq-mile) giant, known as B-15A, could also block sea access to three science stations in the area, according to Antarctica New Zealand agency head Lou Sanson.

He said about 3,000 breeding pairs of Adelie penguins were now facing a long and arduous round journey to bring food to chicks at their nesting grounds at Cape Royds.

"So by the time a penguin comes in from the ice edge on a return... walk, they've used all the food," Mr Sanson told the Associated Press news agency.

"Penguin researchers are predicting that the annual hatching is pretty certain to fail," he added.

The scientists also fear that another penguin colony—at nearby Cape Bird—could be affected by the B-15A.

They said the iceberg had already locked up the ice flows from McMurdo Sound, as it was moving at a speed of 2km a day (1.2 miles). ❑

Visit to a New Emperor Penguin Colony

From Our Peripatetic Polar President...John Splettstoesser

In September 2004, I was on the Russian icebreaker *Kapitan Khlebnikov* in the Canadian High Arctic and Greenland, reaching a northernmost latitude of 81.5° in Nares Strait, with excellent sightings of wildlife and scenery. In November 2004 on the same ship, as a lecturer in geology and glaciology—my 100th or so cruise to Antarctica since 1983—we headed into the Weddell Sea to follow up on the report of a discovery by Argentines in 1997 (N.R. Coria & D. Montalti, 2000: *A newly discovered breeding colony of Emperor Penguins Aptenodytes forsteri*. Mar. Orn. 28: 119-120) of a new Emperor Penguin colony south of Snow Hill Island. The Argentines spotted it from a Twin Otter flyover at 300 meters, and photographs were taken to estimate the population (about 1,200 breeding pairs).

The colony had not been visited since that time, as far as we knew. We found the colony on Nov. 9, 2004 with the aid of our Russian helicopters in a 25-mile flight from the ship, then spent most of a day on the fast ice where the colony was located. Scientist and shipboard lecturer Frank Todd counted 3,885 chicks, indicating a sizeable population of more than 4,000 breeding pairs. The new colony makes the 44th or 45th known for Emperors, with a total population for Antarctica estimated at just over 200,000 breeding pairs. ❑

Under Antarctic Ice: the Photographs of Norbert Wu

With text by Jim Mastro and photographic notes by Norbert Wu
University of California Press, 2004, 176 pp, $39.95.

This extraordinary book of stunning photographs presents the world of Antarctica that few see—under the ice and, in this case, the waters of McMurdo Sound and the life in it.

Norbert Wu was sponsored by the U.S. National Science Foundation to photograph *Under Antarctic Ice*, and Jim Mastro provided the accompanying text. The book is not only a beautiful, hard-cover coffee-table style design, but also includes biological and oceanographic information about the marine life, described in the section on the natural history of McMurdo Sound.

Everything from sea stars, nemertean worms, sponges, sea spiders (pycnogonids), sea anemones, isopods, crinoids and fish varieties are illustrated in color, with notes for each photograph following the main section.

The photos and text cover more than just the underwater world. They also describe the ecosystem of McMurdo Sound; penguins, seals and whales are part of this food chain. There are also spectacular photographs of the scenery of McMurdo Sound—sea ice and icebergs, in particular.

Under Antarctic Ice is in hard cover, 10.5 x 10 inches (31 x 29 cm) in size and printed on durable, glossy paper. It is a "must" purchase for anyone interested in a photographic extravaganza of marine life in Antarctica.

We reproduce here a sample of photos from the book, with the permission of Norbert Wu. ❑ ***Reviewed by John Splettstoeser***

Antarctic Notes

Land Rovers Fail to Reach Pole

Bloomberg.com*, 1 December 2004**—A British-backed team of five explorers in Land Rovers has been thwarted by "atrocious weather" in a bid to be the first people to drive "production" vehicles to the South Pole, the expedition said. ❑ ***(cb Bill Spindler)

Expedition Heads for Earth's Coldest Place

***Australian Antarctic Divison Online (www.aad.gov.au)*, 15 November 2004**—Australia and China are cooperating in a project to install automatic weather stations in Antarctica, including at what is believed to be the coldest place on Earth—Dome A—where the temperature plummets to around minus 90°C. Dome A is located 1200 kms inland from Australia's Davis station. Australian Antarctic Division Glaciology Program Leader Dr Ian Allison said that the new automatic weather station would be up and running at Dome A by the end of January. ❑

$365,000 Boost for Shackleton Hut

Christchurch Press*, 25 October 2004, by John Henzell**—A $365,000 grant from the Getty Foundation will aid the Antarctic Heritage Trust's goal of preserving Shackleton's hut at Cape Royds. AHT executive Nigel Watson said the grant would be used for repair work to preserve the hut for future generations, and also to restore it to its original style, including putting back a canvas roof and replacing the windows installed in 1992 with ones in keeping with the originals. ❑ ***(cb Margaret Lanyon)

Unknown Fish Netted at McMurdo

***www.stuff.co.nz*, 27 November 2004, by Tim Pankhurst**— Art DeVries, renowned for his work on huge Antarctic cod, may have discovered a new small species in Antarctica. Famed for discovering a protein that acts as an antifreeze and allows fish to survive in the frigid Antarctic waters, DeVries may have stumbled on a new species. The fish was caught several days ago by a diver using a net in shallow water near McMurdo. "It is always exciting to find something new," DeVries said. "We will probably take tissue and blood samples and learn all we can about it." ❑

Fish Adapts to Warmer Water

***www.stuff.co.nz*, 24 November 2004, by Tim Pankhurst**—Dr. Bill Davison, a cardiovascular physiologist who is associate professor of biology at Canterbury University, is using the fish *Pagothenia borchgrevinki* to help chart climate change in Antarctica. The sea temperature is a constant -1.8°C and the few fish species in Antarctica have adapted to the extreme cold. The evidence is that "borch" can adapt to warmer temperatures, despite an earlier belief they would not survive. At Scott Base the researchers are keeping borch alive in 4°C, a 6°C increase on the Ross Sea habitat. Changes in physiology and biochemistry as the temperature alters are being studied. ❑

Diving for Climate Change Clues

***www.stuff.co.nz*, 23 November 2004, by Tim Pankhurst**—For five weeks a dive team led by Otago University marine science lecturer Miles Lamare has been investigating climate change. It has determined that ozone depletion over Antarctica is affecting marine life. Slow-growing and long-living organisms such as sea urchins and starfish are showing significant mortality and DNA damage in embryos caused by increased ultraviolet radiation. ❑

Antarctica Cup Yacht Race Postponed

***Yachtinguniverse.com*, 18 November 2004**—The inaugural Antarctica Cup International Yacht Race, a non-stop circumnavigation of Antarctica, planned for a start in 2005 is postponed to a date to be advised. The search for a major event sponsor/s continues. ❑

Antarctic to Get First Cinema

***Pravda Online*, 2 November 2004, by Hernan Etchaleco**—The Argentine Cinema Institute and the Argentine Foreign Ministry on Tuesday signed a cooperation agreement to build a new cinema complex next to the Russian base Bellingshausen, to be opened in February 2005 with 50 seats. The program will be composed of Argentine films, only, which will be subtitled into English. ❑

Antarctic Forests Reveal Ancient Trees

***Discovery News*, 5 November 2004, by Larry O'Hanlon**—Geologists have discovered in Antarctica the remains of three ancient deciduous forests complete with fossils of fallen leaves scattered around the tree trunks. The clusters of petrified tree stumps were found upright in the original living positions they held during the Permian period. Some stumps were even poking up through the snowfield in the Beardmore Glacier area, said geologist Molly Miller of Vanderbilt University. "These were not scrubby little things," Miller said. "These were big trees." Some are estimated to have attained heights of 80 feet, based on their trunk diameter. The long-extinct Glossopteris trees lived in stands as thick as almost a thousand per acre just 20 or 25 degrees from the South Pole, a latitude at which they received no sunlight for half the year. Fossilized tree rings reveal that the Glossopteris grew steadily each summer and abruptly stopped for winter. ❑

Penguin, Seal Food Source Shrinks

Associated Press*, 4 November 2004**—Krill has declined about 80 percent since the 1970s in ocean waters near the Antarctic Peninsula, researchers report. Marine biologist Angus Atkinson, of the British Antarctic Survey, is lead author of a report on krill abundance in Thursday's issue of *Nature*. He and colleagues combined data from nearly 12,000 net hauls done from 1926-39 and 1976-2003. Results showed the Antarctic krill population to be concentrated largely northeast of the Antarctic Peninsula, but they also revealed the long-term declines in summer krill stocks in this area. Statistical analysis suggested the most likely explanation is declines in the amount of winter sea ice in the area of the peninsula. Krill feed on algae found on sea ice. ❑ ***(cb Peter Anderson and Billy-Ace Baker)

Sub-Glacial Lakes: 145 and Counting

National Geographic News*, 1 November 2004, by John Roach**—Deep beneath the Antarctic ice sheets are at least 145 lakes that may be teeming with microscopic organisms. The most recent inventory puts the number of known lakes at 145. "There are large regions yet to be surveyed comprehensively and the only way this number is going to go is upwards," says Martin Siegert, a glaciologist at the University of Bristol. "I would estimate there are 300, 400, maybe 500 lakes." John Priscu, an ecologist at Montana State University, is focused on the ice: "My lab is currently trying to figure out if there is actual metabolism within the ice itself. If so, the entire ice sheet may be alive." ❑ ***(cb Peter Anderson)

Raytheon Contract Extended

***PR Newswire*, 18 October 2004**—Raytheon Company has been selected to continue support services for the National Science Foundation's U.S. Antarctic Program. The support contract extension is for $546 million, bringing the total value of the contract to $1.172 billion and extending the agreement another five years from April 1, 2005 to March 31, 2010. ❑

Antarctica May Warm Rapidly This Century

***NASA News*, 6 October 2004**—While Antarctica has mostly cooled over the last 30 years, the trend is likely to rapidly reverse, according to a computer model study by NASA researchers. The study indicates the South Polar Region is expected to warm during the next 50 years. "Antarctica has been cooling, and one could argue some regions could escape warming, but this study finds this is not very likely," said Drew Shindell of NASA's Goddard Institute of Space Studies (GISS), New York, co-author of the study with Gavin Schmidt, which appeared in the *Geophysical Research Letters*. "Global warming is expected to dominate in future trends." ❑

When Dad's an *Endurance* Survivor, You Clean Your Plate

***Grand Rapids Press*, 3 October 2004, by Terri Finch Hamilton**— Elizabeth Bakewell Rajala, whose father William Bakewell was the only American of the 28 men aboard Shackleton's *Endurance*, says her father didn't talk much about the horrific journey to Antarctica. But he didn't have much patience for whiny kids who complained they were hungry. "He'd say, 'You don't know what hungry is,' " Rajala recalls. "My dad always said, 'Whatever is put on your plate, you eat.'" Rajala, 76, who lives in Munising, in Michigan's Upper Peninsula, recently published her father's memoirs, called *The American on the Endurance*. ❑

Ozone Hole Smaller This Year

***Reuters*, WELLINGTON, 1 October 2004**—A gaping hole in the ozone layer over Antarctica appears to have shrunk by about 20 percent from last year's record-breaking size, New Zealand scientists said on Friday. The National Institute of Water & Atmospheric Research said its measurements backed up NASA satellite data showing the hole peaked at about 9 million sq miles compared with 11 million sq miles in 2003. But NIWA scientist Stephen Wood cautioned against reading too much into the hole's smaller size, which he said was also influenced by natural variations: "We need to see smaller or less severe ozone holes over a number of years before we can say for certain that ozone is recovering." ❑

Chilean Sea Bass Smugglers Flood Market

Associated Press*, WASHINGTON, 20 September 2004, by Lolita C. Baldor**—Federal authorities along the West Coast have seized in recent weeks more than 600,000 pounds of suspected illegal Chilean sea bass, a $10 million haul that environmentalists say reflects a thriving black market. "There is no way for restaurants, grocery stores or consumers to know that their Chilean sea bass is legal, so we encourage Americans to continue to take a pass on it," said Andrea Kavanagh, director of the National Environmental Trust's sea bass report team. ❑ ***(cb Billy-Ace Baker)

Historic Huts Survive 250kmh Blizzard

***Christchurch Press*, 29 September 2004, by John Henzell**—Four months after Scott Base was blasted by a 250kmh blizzard, winter-over staff have been able to confirm that Scott's and Shackleton's historic huts have survived. The ferocious storm in late May caused significant damage to Scott Base and McMurdo Station. "Scott's Cape Evans hut sustained some very minor damage over the winter be-

cause of snow loading," said Antarctic Heritage Trust executive director Nigel Watson. ❑ *(cb Margaret Lanyon)*

New Signs Of Life Found At The Poles

***British Antarctic Survey (BAS) press release*, 22 September 2004**—Large colonies of micro-organisms living under rocks have been discovered in the most hostile regions of the Arctic and Antarctic. Reporting in this week's *Nature*, scientists from BAS and Scripps Institution of Oceanography reveal their surprise findings that rock-dwelling micro-organisms can photosynthesise and store carbon just as much as the plants, lichens and mosses that live above ground. Says BAS microbiologist Dr. Charles Cockell, "Although it's usual to find microorganisms thriving under quartz and translucent rocks in hot deserts because enough light gets through, we wouldn't have expected this type of colonization in the polar regions where most of the rocks are opaque. Also, the harsh UV-radiation and violent winds make for a hostile environment. We found that in fact the opaque rocks protect the micro-organisms and, the movement of rocks during the annual freeze-thaw allows cracks to form and light to penetrate beneath the surface." ❑

Dome C Perfect For Stargazing

***news.nature.com*, 15 September 2004, by Mark Peplow**—Researchers studying atmospheric turbulence above the Dome C research station, 1,670km from the South Pole, found the air so still that light from distant stars was disrupted far less than anywhere else on the planet. "Dome C is the best ground-based site to develop a new astronomical observatory," says Michael Ashley, an astrophysicist from the University of New South Wales, and colleagues in this week's *Nature*. Even at high-altitude sites elsewhere on Earth, stars seem to jitter in the sky, moving by about 140 millionths of a degree. But over Dome C, the jitter was as low as 19 millionths of a degree, by far the best value ever reported. In order to compare to an optical or infrared telescope built at Dome C, a telescope built at one of the next best sites around the world would have to be two or three times as large. ❑

Shackleton Expedition Pictures 'Faked'

***The Observer*, 22 August 2004, by Vanessa Thorpe**—Frank Hurley's iconic photographs of the Endurance expedition are not all they seem. Australian Alf Howard, 98, was a young chemist in 1929 when he won a crew place on Robert Falcon Scott's former vessel, *Discovery*, which was to be taken back to Antarctica by Douglas Mawson. He struck up a firm friendship with Hurley, whose darkroom door opened into his own laboratory on *Discovery*. "He would not go against the truth, but he would do anything to highlight a particular point," said Howard. "He would modify the background to a picture. He had a very good idea of what the thing would look like." The well-known image of Shackleton's departing open boat is one of those later embellished in the dark room by the addition of a brooding cloudscape. The pressure was on Hurley to make money for the expedition from photographs and films. The words, 'Near enough is not good enough,' were scratched into the wood over his dark room and he took great physical risks to get a dramatic shot. ❑

New Era for Norway's Antarctic Research

***www.innovations-report.com*, 5 August 2004**—The Norwegian summer station, Troll, will be a year-round station beginning in February 2005, and at the same time the airstrip beside Troll will be able to receive heavy intercontinental flights between South Africa and Queen Maud Land, a six-hour flight. ❑

Lake Vostok: Two Basins Revealed

***National Science Foundation press release*, 7 July 2004**—Scientists from Lamont-Doherty Earth Observatory and Rensselaer Polytechnic Institute have developed the first-ever map of water depth in Lake Vostok, published in the June 19 edition of *Geophysical Research Letters*. The lake is divided into two distinct basins that may have different water chemistry and other characteristics. "The ridge between the two basins will limit water exchange between the two systems," says researcher Michael Studinger. "Consequently, the chemical and biological composition of these two ecosystems is likely to be different." Researchers estimate that Lake Vostok contains 5400 cu km of water. The top of the ridge dividing the two basins is only 200m below the bottom of the icesheet. Elsewhere, the water depth ranges from roughly 400m in the northern basin to 800m in the southern. ❑

Undersea Volcano Found in Antarctic Sound

***National Science Foundation press release*, 20 May 2004**—Scientists working aboard the research vessel *Laurence M. Gould* in the Antarctic Sound have found what they believe is an active and previously unknown volcano on the sea bottom. Evidence the team collected corroborates mariners' reports of discolored water in the area, which is consistent with an active volcano. Eugene Domack, the expedition's chief scientist, said the volcano stands 700m above the seafloor and extends to within roughly 275m of the ocean surface. The volcano, which has yet to be named, is unusual, Domack said, in that it exists on the continental shelf, in the vicinity of a deep trough carved out by glaciers passing across the seafloor. ❑

Nematode May Shed Light On Freezing Organs

***New Zealand Press Association*, 16 June 2004**—Antarctic nematodes which survive being frozen alive for nine months of the year may hold the key to improved storage of organ transplants, say University of Otago scientists who have grown a culture of Antarctic nematodes in a university lab to learn some of the secrets of their survival. The worm is the only animal known to survive freezing within its cells—a usually-fatal process. The research team has mapped the gene sequence of an "ice-active protein" produced by the nematodes, which affects the formation and stability of ice. ❑

Japan Removing Trash From Antarctica

***Associated Press*, TOKYO, 17 June 2004**—Japanese researchers are getting serious about cleaning up the half-century's worth of garbage piled up at their Antarctic base. By 1998, cast-off building materials, snow vehicles and fuel drums at the station weighed about 550 tons and research teams began clearing the pile. Japan's Science Ministry hopes to send the remaining 370 tons of garbage home within four years. ❑ *(cb Billy-Ace Baker)*

Antarctic Research Ship Guns For Poachers

***Australian Broadcasting Corporation News Online*, 29 June 2004**—The Hobart-based Antarctic research ship *Aurora Australis* has been fitted with two deck-mounted 50-calibre machine guns as Australia steps up its efforts to deter Patagonian toothfish poachers in the Southern Ocean. The ship will patrol the region around Heard and McDonald islands, in Australia's economic zone. ❑

Wreck of Byrd Ship to be State Preserve

***Associated Press*, PENSACOLA, Fla., 6 July 2004, by Bill Kaczor**—The wreck of a tramp steamer that helped Adm. Richard Byrd explore the Antarctic but later sank in 1942 under mysterious circumstances off the Florida Panhandle is the state's newest underwater archaeological preserve. Said Della Scott, a state archaeologist: "Local people are still absolutely convinced it was sabotaged." Byrd purchased the vessel for $34,000 from the U.S. government in 1928 after it had been confiscated for Prohibition-era liquor smuggling. Byrd renamed it *Eleanor Bolling* after his mother; the crew referred to it as the "Evermore Rolling" because of its instability. It transported crates containing two airplanes to Little America because holds aboard his primary expedition ship, the *City of New York*, were too small, although a third plane had been lashed to the wooden-hulled sailing vessel's deck. Byrd sold *Eleanor Bolling* to an Arctic sealing company in 1930. ❑ *(cb Billy-Ace Baker)*

X-Rays Reveal First Antarctic Painting

***Reuters*, LONDON, 5 July 2004, by Jeremy Lovell**—The first known oil painting of Antarctica, hidden for more than two centuries under a tropical picture painted on Captain Cook's second voyage of southern discovery, is to go on display. The iceberg picture, revealed by X-rays and shown only as a photograph to avoid destroying the overpainted scene of Pickersgill Harbour in New Zealand, is one of 80 works on show at London's National Maritime Museum by long-forgotten English artist William Hodges. The discovery of the hidden icebergs is the first known eye-witness oil painting of the Antarctic. Hodges, the son of a London blacksmith, was 28 when he joined Cook's second expedition in 1772. ❑ *(cb Billy-Ace Baker)*

Penguins Eat Shells To Get Calcium For Thicker Eggshells

***University of Washington News*, 10 May 2004**—Magellanic penguin eggs come with extra-thick shells to withstand being laid on hard surfaces and survive being kicked around during penguin fights. New research by University of Washington biologist Dee Boersma shows that during the period when eggs are being laid, female penguins have significantly more mollusk shells, mainly clams and mussels, in their stomachs than males do. The mollusk shells gradually leach calcium used to form eggshells. But, said Boersma, lead author of a paper published recently in *The Auk*, "There's a point where you can't build strong-enough eggshells to survive fights. If you could, the chicks probably couldn't get out."

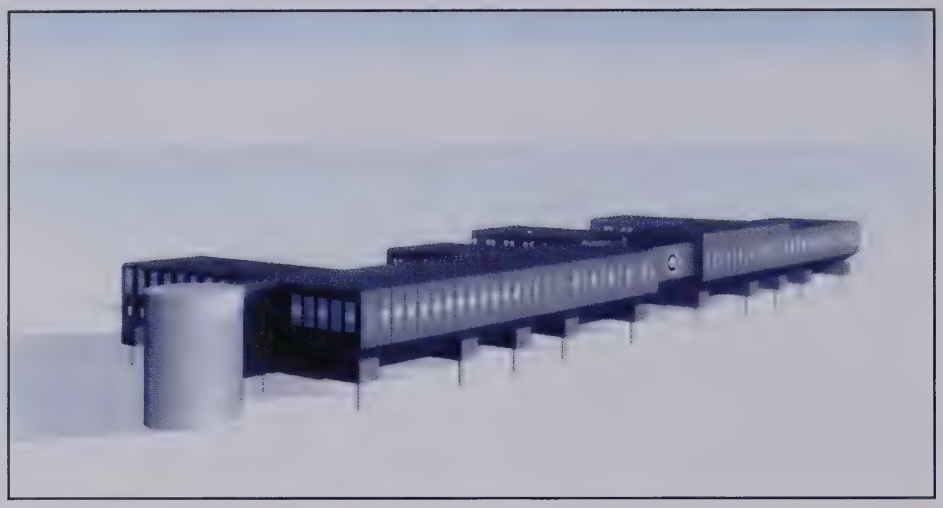
From 1984 through 2001, Boersma and her colleagues gathered data on 10,023 eggs at a Magellanic penguin reserve at Punta Tombo, Argentina. Just 257 of the eggs, or 2.6 percent, were broken by anything other than predators or human-caused accidents, similar to the rate for birds that do not nest on hard surfaces or fight in the vicinity of the nest. Fully 43 percent of the broken eggs were destroyed because of fights. ❑

Australia Gets Air Service to The Ice

Hobart Mercury, 4 December 2004, by Charles Waterhouse—When 'Gadget,' the orange and white Spanish-built CASA 212-400 aircraft flies out next week, it will signal the start of a new era in Australian Antarctic science and exploration. Later this month Gadget will be joined by its sister aircraft, Ginger, and both will start their role ferrying equipment and people between Australia's three Antarctic bases, Davis, Casey and Mawson. Gadget and Ginger are named after huskies that served with Mawson on his 1911-14 expedition. The flight from Hobart to Casey station is about 12 hours. ❑ *(cb Billy-Ace Baker)*

South Pole Station Right on Schedule

by Jeff Rubin, Antarctic Editor



Artist's rendition of the finished South Pole Station

Photo by Jerry Marty

The new South Pole Station, still under construction, is shown here as viewed from the side (above) and from the front (below).

Photo by Jerry Marty

The new elevated Amundsen-Scott South Pole Station is on target for completion in January 2007—in time for two important milestones: the beginning of the International Polar Year 2007–2008 and the 50th anniversary of the first season of human habitation at the South Pole.

"We are in very, very good shape," says Jerry Marty, construction project manager. "Our progress over the winter has been successful to the point that we're going to take a hard look and see if we can complete section B-3 (communications, administration and conference rooms) for conditional occupancy in January 2005."

> *"When you ask someone how they're doing, more often than not, the response is, 'Living the Dream.'"*

Meanwhile, the Seabee Museum continues to investigate the possibility of returning part of the Dome to the U.S. for eventual display. Two representatives arrive at 90°S the first week in February. Says Marty: "We now have to match ideas with reality to find out what makes sense in terms of budget and timing."

This summer season, Marty expects the construction crews to finish the steel-framing and panel-enclosure of the two remaining sections of the station, A-4 and B-4, meaning that the entire station will be weather-tight, and work can focus on completing the interior.

Four separate "topping out" ceremonies are planned for this summer season alone.

Ironworkers hold a topping out ceremony to mark the placement of the highest steel beam in a construction project, but at South Pole, the ritual has been held to mark the completion of various phases of the project.

Traditionally, an evergreen tree and an American flag are attached to the final beam before it is raised into position, but since environmental regulations prohibit introduced species in Antarctica, no tree is used at the Pole.

> *"The sense of pride is definitely there ... and there's a real* esprit-de-corps. *It's a fun-loving team, and it becomes a second family."*

The Stars and Stripes, however, takes pride of place on the beam, and the same flag has been used in all the topping out ceremonies held so far at the Pole.

Marty hand-carries the flag home with him at the end of each season to ensure that it's not misplaced, then brings it back when he returns. He intends to use the same flag when the final pallet carrying the last of the unused construction materials is loaded into a Hercules for return to the States.

"The sense of pride is definitely there again this year," Marty says. "Each and every one of these workers is familiar with the equipment and the materials, and there's a real esprit-de-corps. It's a fun-loving team, and it becomes a second family.

"When you ask someone how they're doing, more often than not, the response is, 'Living the Dream.'"

So great is the enthusiasm for the work among the stalwart builders, Marty says, that several are already looking ahead to when the superstructure and exterior panel work is done: "A couple of them have talked to me and said 'What do you have for us after that?' They want to stay another two years—and they want to be there for the station dedication in 2007. ❑

Photo by Terry Marty

A crane lifts a new wall into place at the burgeoning new South Pole station.

Growth Chamber Provides 'Freshies'—and Greenery

One of the most popular and psychologically important parts of the new South Pole station is the greenhouse. In keeping with the futuristic cast of the entire complex, however, it is not a greenhouse, but, in Polie parlance, a "food growth chamber."

This 340-square-foot facility boasts 240 square feet of growing area, with the remainder used for equipment and space for station members to hang out with the green plants, which are all grown hydroponically, as no soil is permitted to be introduced to Antarctica.

The food growth chamber's lights, warmth, humidity and green plants are for many residents a very welcome change from the white world of the Pole.

"There have been a number of design and operational issues associated with the food growth chamber since operation started around the middle of June," says William Henriksen, South Pole Station Winter Site Manager. "Production has not been up to the expected level, but many of the issues are being resolved.

"In general, the tomatoes and lettuce have not done well," Henriksen says. "The herbs have done fairly well but are hardier plants."

Nevertheless, the list of crops being grown by the world's southernmost farmers is impressive: cucumbers, lettuce, spinach, endive, basil, dill, cilantro, mint, chervil, parsley and three varieties of tomatoes.

In addition, flowers are grown—at least, species that are edible, for the Antarctic Treaty's environmental protection provisions require that introduced plants in Antarctica be grown only as food.

So the South Pole growth chamber also lights up color-starved eyes with the brilliant hues of marigolds, bachelor's buttons, nasturtiums, and calendula.

Key harvests to date include July 24, 2004, when 3.275kg (more than seven pounds) of lettuce were cut, and Sept. 8, 2004, when a total of 12 tomatoes were picked.

For those of us who have never wintered in Antarctica, full appreciation of such "freshies" is probably impossible. ❑ ***J.R.***

Photos by William Henriksen, South Pole Station Winter Site Manager

James Van Allen: From Poulter and Byrd to the IGY and Beyond

by Bob Kremenak

Photo by Bob Kremenak

James Van Allen receives the American Polar Society's Honors of the Society award in a ceremony in the Aurora seminar room of Van Allen Hall on the University of Iowa campus.

James A.Van Allen, born in Mt. Pleasant, Iowa, in 1914, first gained wide recognition for his investigations of the earth's radiation belts that now bear his name. Today he and his wife, Abigail, still reside in Iowa City, where he has been a professor at the university since 1951.

My home is in Iowa City too, so when Van Allen could not come to Columbus last fall to receive his honors medal (see sidebar story), I was asked to bring it home and to have an award presentation here. When I talked to him about this, the professor requested a "brief and low-key" ceremony, which we held for him in July in the Aurora Room in Van Allen Hall on the University of Iowa Campus. I began collecting stories about James Van Allen then. Here are some of them.

The first is from Brian Shoemaker, who came to Iowa City in 1997 to record an oral history interview with Van Allen. When I asked Brian for a copy of the interview last summer he e-mailed it to me with the following message: "Before we started the tape recorder, I suggested that he tell me where he was from and who his mentors were. He stopped me right there and said, 'That's easy. My mentors were Tom Poulter and Admiral Byrd. They were the two most influential men in my life.' For heaven's sake," Brian told me, "I hadn't expected *that!*"

Then in Shoemaker's interview, Van Allen talked at length about Poulter and Byrd. Tomas Poulter had been Van Allen's physics professor at Iowa Wesleyan College in Mount Pleasant. This part of Van Allen's relationships with Poulter and Byrd is also described by George H. Ludwig in a recent unpublished manuscript. Ludwig wrote that "Poulter had been chosen by Admiral Richard E. Byrd as his chief scientist for the 1933-35 Second Byrd Antarctic Expedition. He had the task of planning and conducting geophysical investigations during that expedition. Van Allen assisted Poulter in those preparations; his contributions included the development of a number of instruments, including a simple seismograph and a tilt-meter for recording the shifting of glacial surfaces."

> *Poulter invited Van Allen to accompany him as a member of the Antarctic Expedition ... his parents vetoed the idea.*

Continuing, Ludwig noted that, "Poulter invited Van Allen to accompany him as a member of the Antarctic Expedition, but his parents vetoed the idea. He had to be content with listening avidly to the short-wave radio reports from Little American to follow the expedition's progress. He, with the rest of the world, was electrified by Poulter's heroic rescue of Admiral Byrd from his lonely vigil at South Pole Station in August 1934. Poulter and Byrd were honored by a public parade in Mount Pleasant the next summer, and Admiral Byrd delivered the chief commencement address at Van Allen's graduation exercises."

Van Allen recalled parts of the same story in Shoemaker's 1997 interview. "Anyway, I followed the expedition very assiduously and about once a week there was a radio broadcast from Little America after they got there and got established. There was a man by the name of Harry Vonzelle who was an announcer at a radio station in Chicago, I think it was. On Sunday night or some other standard time of the week, they would establish communications with Admiral Byrd at Little America and he would describe what was going on and how things were going. It started...something like ...'This is Little America...' It was a great thrill for me because I knew somebody who was there."

Later in the Shoemaker interview, Van Allen told some of his memories of his graduation from Iowa Wesleyan College. "Poulter and the other members of the expedition returned to the United States in May 1935. I was then a senior in college and scheduled to graduate in early June. Both Poulter, who was a local hero in our area, and Byrd, who was a national hero, were invited to our commencement. Both accepted. So, in June of '35, the little town of Mt. Pleasant staged a huge parade. Byrd and Poulter were honored as returning explorers. They rode in a big old Cadillac convertible in the parade. Both received honorary degrees at the Wesleyan commencement." Brian asked in the interview, "[They] sat up in the back of the convertible?" "Yes," Van Allen said, "[they] sat up on the back and greeted bystanders. Byrd was a very impressive figure, of course, in his sparkling white full dress uniform. Very impressive national hero. He gave the commencement address, I believe."

After graduation from Iowa Wesleyan, Van Allen told Shoemaker, he went to the University of Iowa in Iowa City, where he studied "more or less conventional physics and completed a Ph.D. in nuclear physics in 1939." From there he went to the Carnegie Institution in Washington as a Research Fellow in nuclear physics and then, at the beginning of the war, "I converted to what we then called war work, namely, helping to develop a device for naval anti-aircraft guns called the radio proximity fuse."

Later, in 1942, after working on the proximity fuses with a group at the Applied Physics Laboratory at Johns Hopkins, Van Allen and two other colleagues were given "spot commissions" as lieutenants, j.g., and sent to sea to monitor the performance of the fuses. "Our total instruction in how to become naval officers consisted of two pamphlets they gave us to read while we were en route." Van Allen told Shoemaker about problems with the batteries in fuses that had been stored for a long time at high temperatures: "By the time they got there, some of the batteries were dead. So I then went back to the States as a kind of missionary to get something done about this. I took on the personal responsibility to bring this to the attention of the people who were at the supply end and to get something done about it for the sake of the Fleet. I was making a nuisance of myself around the Washington, D.C. area, but I did persuade the Bureau of Ordinance to (a) send me back out, (b) supply at least for a while, fresh batteries by air

shipment, and (c) authorize me to set up re-batterying depots at various advance stations."

After being sent back out to the Pacific, Van Allen said, "I went all over the Pacific by military aircraft. I also rode on ships if more convenient. One ship I rode on was a YP boat from Guadalcanal to Noumea during which we were attacked by a Japanese aircraft en route. We were just slogging along at about 10 knots—the YP boats were former tuna fishing boats out of San Diego which were commissioned as what the Navy called reefer ships. ... The Japanese plane dropped several bombs near us but never hit us.

"During the Battle of the Philippine Sea," Van Allen continued, "I was back on the battleship *Washington*, at Admiral Lee's request. In helmet and life jacket, I stood right beside him elbow-to-elbow on the bridge during a major air attack. Fortunately the *Washington* was not hit, although we had been singled out for special attention. We had at least two low-level torpedo bombers attack us and one that was intended to be a dive bomber attack. And we shot them all down. I was never one hundred percent sure if the proximity fuse did it because every anti-aircraft gun on the ship was firing. All the 40s and 20s were firing. The air was full of bursts from a mixture of time fuses and proximity fuses, so I never could swear on a stack of Bibles that our fuses really did the job, but I thought they probably made a significant contribution. ... I was placed on inactive duty in May of '46 as a lieutenant commander, with three battle stars on my Pacific ribbon."

Van Allen next told Shoemaker about some of his early rocket work. "Then I went back to the Applied Physics Lab [at Johns Hopkins] as a civilian. I had earned my spurs around there, and I was authorized to build up a high-altitude research group using German V-2 rockets which the Army had captured and brought back to the States in late '45. I built up a group doing scientific research with high-altitude rockets. Originally the V-2s and then with the American Aerobees whose development I oversaw. The latter were unguided vertically-fired sounding rockets. ... I was the guru of the Aerobee, yes. We started it in the autumn of '46 and had the first firing in '47. I oversaw the whole development including putting them into operation at the White Sands Proving Ground in New Mexico. ... The Aerobees were built by Douglas Aircraft Company and the Aerojet Company. The Aerobee and its successive upgrades continued to be the work horse of high-altitude research for many years thereafter. A total of 1,049 Aerobees had been flown up until their retirement in 1988."

There are many stories of how the idea for the 1957-58 International Geophysical Year (IGY) was born in James Van Allen's living room. In this one, from the 1997 Shoemaker interview, Van Allen tells about working at the Applied Physics Lab in 1950 and inviting some other There are many stories of how the idea for the 1957-58 International Geophysical Year (IGY) was born in James Van Allen's living room. In this one, from the 1997 Shoemaker interview, Van Allen tells about working at the Applied Physics Lab in 1950 and inviting some other geophysicists to dinner at his "modest little house in Silver Spring, Maryland.... Included were Sydney Chapman, Lloyd Berkner, Wallace Joyce, and Harry Vestive. Van Allen remembers Berkner saying to Chapman, "Well, Sydney, don't you think it's about time for another polar year, say on the 25th anniversary of the Second International Polar Year, 1932-33?" More planning talk followed. "Then we had a very good dinner," Van Allen recalled, "which my wife prepared and then she hustled our then two daughters off to bed while the men gathered in the small living room and shared some very good conversation. For dessert my wife had prepared a multi-layered chocolate cake which was made of about ten thin pieces of cake..., each one of which was covered with chocolate frosting. It made a fantastic dessert which she served that evening. I thought that her dinner was one of the important bases for planning the IGY."

James Van Allen was named a member of the National Academy of Sciences in 1959, and had received many honors and awards before ours from the Polar Society last year. In 1987 ceremonies at the White House, President Ronald Reagan presented him with the National Medal of Science, the nation's highest honor for scientific achievement. And in 1989 he received the Crafoord Prize, awarded by the Royal Swedish Academy of Sciences in Stockholm and presented by the King of Sweden. The most recent award was from Iowa's Governor Tom Vilsack at the University's Van Allen Day on October 9, 2004 commemorating the still hard-at-work professor's 90th birthday. ❑

UK-Led Team Traces Amundsen's Route

***Reuters*, LONDON, by Katie Allen**—A team of explorers has reached the South Pole after becoming the first adventurers to retrace the steps of Norwegian pioneer Roald Amundsen.

By completing the journey in 37 days, they set a new standard for the route between the foot of the Trans-Antarctic mountains and up The Devils Glacier, a path Amundsen used to become the first man to reach the South Pole in 1911.

But the three Britons and a Canadian will have little time to celebrate because they also hope to make it into record books with the fastest crossing of the whole continent of Antarctica.

Speaking to Reuters by phone from the pole, team leader Patrick Woodhead, 28, said his group was "deliriously happy" but still had 1,200 km to cover.

"It kind of dampens the enjoyment of reaching the South Pole a little bit but it's still fantastic...and it's been a hell of an adventure just getting here," he said.

"Whereas most expeditions stop at the South Pole that's only a third of the way for us," said Woodhead, whose group set out from the New Zealand side of Antarctica with skis and sleds. The unusual route made the polar challenge particularly appealing.

"There's been no information so it's been really exciting trying to work our way up through the glacier and also incredibly hard work," he said. "We have been weaving our way through ice falls that have crevasses the size of cathedrals."

The team estimates that each member burns between 7,000 and 8,000 calories as they haul their sledges through the snow each day in temperatures around minus 30 degrees Celsius—the equivalent of running two marathons daily.

But the next part of the trip should be plain sailing in comparison.

The explorers are swapping their sledges for special kites and hope the wind will pull them the rest of the way.

"They are incredibly powerful things, so if we manage to get them under control we are going to be able to sail across that distance. The way the winds work, we should be able to sail the whole way back," said Woodhead, who in 2002 became the youngest Briton to reach the South Pole.

There is also an unusual Christmas to look forward to.

"It's going to be four guys sitting in a tiny tent in the middle of nowhere," said Woodhead. ❑

Van Allen Receives APS Award

IOWA CITY, Iowa, 15 July 2004—James A. Van Allen, Regent Distinguished Professor of Physics and Astronomy in the University of Iowa College of Liberal Arts and Sciences and a founding father of space exploration, received the American Polar Society's Honors of the Society award in a brief ceremony at 4 p.m. today in the Aurora seminar room of Van Allen Hall on the UI campus.

Van Allen had been named an award recipient during the Oct. 9-10, 2003 APS symposium held at the Byrd Polar Research Center at The Ohio State University in Columbus, Ohio, but had been unable to attend at that time.

Today's ceremony was conducted by APS representative and U of I emeritus professor Bob Kremenak. He presented the award medal with assistance from U of I Dean of the College of Arts and Sciences Linda Maxson. Included on the award certificate was the inscription, "To James A. Van Allen in recognition of his exemplary lifetime contributions to polar and planetary research and exploration."

Others attending the ceremony were Professors Donald A. Gurnett, a former Van Allen student and a current Jupiter/Çelini mission scientist, Thomas F. Boggess, Physics Department Chairman, Abigale Forstner, Van Allen's biographer and Christine L. Stevens of the Physics Department's administrative staff.

Van Allen spoke briefly after accepting the award, recalling his polar cruises on various Coast Guard ships as well as the ice breaker *U.S.S. Glacier* (AGB-4), from whose flight deck, in 1957-58 he and his colleagues deployed balloon-launched rockets in studies of what later became known as the Van Allen radiation belts. ❑

A nearly snow-free Peary Land as seen from a Twin Otter plane cockpit in 1996

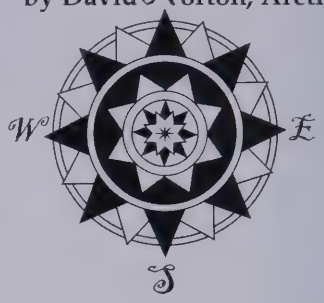
PHOTO BY GALEN ROWELL

Ideology and Objectivity in Arctic Research

by Dave Norton, Arctic Editor

Due North

by David Norton, Arctic Editor



Shortly after one midnight in September 2004, I was astonished to hear a radio talk-show host express alarm over a recent Arctic discovery. What Arctic finding rated this alarm? A population of mussels (*Mytilus*—either blue, *M. edulis,* or Baltic, *M. trossulus*) was found living on the ocean floor "near the North Pole." The host's take was that the ocean has warmed so dramatically that these molluscs are invading previously frigid latitudes. I was tempted to dismiss his alarmism, fitting as it did the theme of his widely broadcast show, featuring UFOs, conspiracies, ghosts and portents of global doom.

I knew his concern was misplaced. I had worked with colleagues for several years to review nearly 100 studies and surveys of both modern and fossil distributions of *Mytilus* and other bivalve molluscs in Arctic waters. Nine months earlier, the results of our analysis were published in the peer-reviewed journal, *Arctic*.[1] We concluded that mussels for the last 2 million years—undeterred by cold water—have been living around the Arctic Basin as far north as about 80° N (i.e., to nearly the northernmost coasts in the hemisphere, or 600 nautical miles, 1100 km, from the North Pole). Admittedly, Arctic populations of what French cuisine has helped become the world's most widely recognized genus of bivalves fail to achieve abundance because Arctic mussel beds are intermittently wiped out by ice scour, buried by storm-suspended sediments, and killed off by predatory snails and sea stars. We explicitly rejected concluding that living mussels indicate rising sea temperatures in the Arctic. Instead, we presented evidence that *Mytilus* populations take refuge in less saline or brackish water to escape freshwater-intolerant predators. Equally explicitly we predicted that systematic searches would find mussels widely in brackish coastal waters around the Arctic Basin. Indeed, our work inspired several Arctic investigators to start searching for mussels in 2003.

Using the Internet, we soon traced the alarmist's source to a Reuters story[2]. A trio of scientist-divers had found mussels living at the mouth of Isfjord in Spitsbergen, the largest island in the Svalbard Archipelago. To Reuters, this discovery meant that the bivalves were moving north into waters where they had not been seen "since Viking times 1,000 years ago during another warm period." The story cited other anecdotal evidence for polar warming, including American Robins showing up in Canada's Arctic archipelago and European birch trees invading Saami reindeer herders' treeless tundra.

Upon learning their identity, we sent congratulations to the three scientists for confirming our prediction that *Mytilus* would be found living in Svalbard's cold waters. Having mailed them (months earlier) a copy of our published article, we assumed our prediction had encouraged them to look for mussels and that Reuters had invented the global warming twist. Before we heard back from the divers, the original "gee-whiz" story was parroted and amplified. By the time CNN reprinted it, its headline had morphed: "Mussels near North Pole hint at warmer Earth." You'd have thought the seas around Svalbard were about to boil away. Alarmism so hyperventilated the radio host that I heard the same guy earnestly warn another guest weeks later, "The North and South Poles are melting," for which conclusion he cited the Svalbard mussels. If commercial radio and news media treat scientific observations so glibly, we had to wonder whether we could believe anything they report about discoveries in specialties of science outside our own immediate experience.

We then learned that Reuters had accurately reported a scientific opinion: the mussel discoverers had said they believed *Mytilus* living in Svalbard to be a symptom of warming oceans. Reuters had broadcast their opinion before they had read our alternative interpretation. The discoverers admitted neglecting to read our article. Discussing the significance of findings with news media normally takes place *after* doing so with other scientists, such as publishing opinions in journals. This case of reversing the sequence has tested my belief in freedom of speech that guarantees everyone—especially scientists—the right to say things they later need to amend or retract. (A senior scientist once mused to young scientific editors, "You can't keep authors from making fools of themselves occasionally.")

> *it is easier to detect and report phenomena that support the ideology of those who hold the purse strings.*

In environmental studies, current fashion leans toward observations-in-support-of-modeling. As the *Polar Times* readers know, one of the prominent concepts in vogue is that of "global climate change," especially as manifested in polar regions. Middle ground is hard to find between two clashing camps. One ideology has until recently denied connection between burning fossil fuels and CO_2 as a greenhouse gas, doubted the reality of climate change and still resists endorsing the Kyoto Treaty. In the opposing camp, mathematical modeling of the climatic effects of increasing greenhouse gases may nurture an equally ideological position, if modeling predetermines conclusions drawn from environmental observations. Especially in a culture of instant gratification, it is easier to detect and report phenomena that support the ideology of those who hold the purse strings ("You gotta believe it to see it.").

When asked my stance on global change, especially if the question is phrased as "warming," I answer by calling myself "agnostic." Charles Wohlforth's *The Whale and the Supercomputer* (see review, this issue) shows that fellow agnostics include some of the keenest field observers in the North, the whalers of northern Alaska. Agnosticism, or holding middle ground between opposing ideological camps, takes energy and vigilance. I was asked recently to review a consultant's report to state and municipal governments in Alaska. In one section, the report undertook to forecast the effects of "climate change" on constructing a gas pipeline from Alaska's North Slope to Alberta, Canada. The writer began one sentence with, "As these warming trends continue..." thus tipping his ideological hand. An objective discussion should have been introduced by, "*If* these warming trends continue..."

Being agnostic does not mean rejecting sober findings in the recently released Arctic Climate Impact Assessment document assembled by nations comprising the Arctic Council. Nor does it mean denying reports that Humboldt squid and other species are being detected farther north than ever. Agnostics, however, want causal links between observations and climate change to be tested rigorously before they become credo. If it deserts its own rules of evidence, science risks being drawn into a shoving match with those whose ideology makes them resistant to signing onto the Kyoto Treaty Protocols.

Examples of abandoned agnosticism in relation to environmental change surround us. Researchers may see their mission in funded research as adding to the list of symptoms of global warming, the scientific establishment's accepted litany. In turn, students line walls of academic institutions with seminar notices and poster presentations that are consistent with their faculty's perceived mission. The litany lengthens. Too rarely does anyone pause to evaluate a signal critically or suggest its removal from the catechism. With a little practise, you could distinguish agnostic or objective examples of reported signals of climate "change" from ideologically narrowed signals of "warming." But heck, you may find beachcombing for Arctic mussels more satisfying. ❑

[1] *Feder, H.M., D.W. Norton, and J.B. Geller. 2003. A review of apparent 20th century changes in the presence of mussels (*Mytilus trossulus*) and marine macroalgae in Arctic Alaska, and of historical and paleontological evidence used to relate mollusc distributions to climate change.* Arctic *56(4):391-407.*

[2] *http://www.reuters.co.uk//...topNews&storyID =585843, "Mussels Found Near North Pole" 17th Sept. 2004*

Navy Recovers Last Remains of Aviators

***Associated Press*, NORFOLK, Va. 19 August 2004, by Sonja Barisic**—Cold, windburned and on the alert for polar bears, a Navy team recovered the last remains of aviators lost on a remote glacier in Greenland when their plane crashed more than 40 years ago. The plane, equipped to track Soviet submarines, went down Jan. 12, 1962, during the Cold War, while on a routine reconnaissance flight. The remains of seven of the 12 crew members were recovered more than four years later.

The Navy team that returned home early Wednesday after an 11-day expedition to the site did everything possible to find the rest, said the team leader, Capt. Tom Sparks.

"I'm reporting out that we've been 100 percent successful in that mission," Sparks told reporters at Norfolk Naval Station. "My hope is that our efforts and our mission success does bring some comfort and closure to the family and friends" of the crewmen, he added.

The team found human remains, personal effects and military artifacts. Sparks said he could not provide details. The identities of the crewmen first must be confirmed through DNA testing by military laboratories, a process expected to take at least four months.

In recent years, friends, relatives and fellow aviators pressed the government to bring back the last remains. The mission cost about $250,000.

"It's a prayer that's been answered," said Bob Pettway, of McDonald, Tenn., who was in the same aircraft squadron as the crew and led a campaign to write letters to Congress to try to spur action. "I'm just as happy as I can be that they recovered all of them," Pettway said in a telephone interview Wednesday.

The wrecked aircraft, a P-2V Neptune aircraft out of the naval station in Keflavik, Iceland, went down during an 8 1/2-hour flight, Sparks said. The plane initially was thought to have gone down in the ocean, but in August 1966, British geologists found the wreckage while hiking on Greenland's remote Kronborg Glacier when some of the snow cover had melted.

By the time a Navy team reached the site in September, it was covered again in snow. The remains of seven crewmembers were recovered, returned to the United States and buried with full military honors. The Navy thought all known remains had been recovered, Sparks said.

But one of the British explorers returned to the area in the summer of 1995, during an unusual warm spell that exposed much of the glacier, and saw human remains when he flew over the crash site. Sparks said the weather deterred the Navy from making another search attempt until this summer, when conditions were again unusually warm.

Aided by ground-penetrating radar and dogs trained to sniff out remains, the 16 team members searched a two-mile by three-mile area. The team endured winds gusting up to 55 mph and temperatures that dropped into the teens at night. "We had to really look out for each other," Sparks said. "We had to worry about things like polar bears."

The team held a memorial service at the site on Aug. 12. ❑

Icebreaker Prepares for Next Voyage

***Associated Press*, SEATTLE, 20 November 2004, by Peggy Andersen**—The Coast Guard icebreaker *Healy*, just back from its annual research trek to the Arctic, is already preparing for next year's voyage—a joint venture with Sweden in the white world of the polar north. The U.S. vessel will be working with the Swedish icebreaker *Oden*, plowing through sea and ice to take deep sediment samples from the ocean floor at the top of the world. The *Healy*, which is based here, will set out from Barrow, Alaska, and the *Oden* from Tromsø, Norway.

For the past three seasons, scientists aboard the *Healy* have been focusing on "shelf-basin interaction," the area where the continental shelf meets the seafloor.

The 420-foot icebreaker accommodates several teams of scientists—multidisciplinary and multinational—every six-month season, to make best use of the access it provides to one of the planet's most hostile environments, said Margo Edwards, a marine-geology researcher from the University of Hawaii who heads the *Healy*'s academic advisory committee. "It's beautiful up there—very spare," Edwards said, displaying computer-screen photos of the pink, blue and white landscape of sea, snow and ice.

This year's focus was water, with scientists measuring nutrients, temperatures, salinity and pollution as water moves from the shelves to the deeper ocean. The results will be discussed at an American Geophysical Union meeting December 13-17 in San Francisco.

Next year is geology. Edwards will be following up on a 1999 expedition on a Hawaii-based nuclear submarine. The work with the Tromsø team is to "see what the structure is" beneath the sea. In 2006, polar bears and other Arctic wildlife will be in the limelight, with researchers using the *Healy*'s two helicopters to collect census data.

She and other scientists met on the Seattle waterfront Friday with the *Healy*'s executive officer, CMDR. William Rall, and other officers to plan for next year's voyage on the vessel, whose motto is "420 feet of icebreaking steel." The ship, operated by a Coast Guard crew of 99, can carry up to 51 guest scientists.

In 1999, Edwards and a colleague determined that glaciers—long a subject of land-based research and speculation—had in fact moved north from Canada and Europe into the polar region. They found glacier footprints on the seafloor—"flutes" left by passage of the grooved ice and "moraines," the piles of rubble left when a glacier stops pushing across the landscape and withdraws. ❑

Ancient Creature Fossilized By the Bacteria That Ate It

***researchnews.osu.edu*, DENVER, 10 Nov. 2004**—High in the mountains of Antarctica, Ohio State University geologists unearthed the fossil remains of a 180-million-year-old clam-like creature that was preserved in a very unusual way: by the ancient bacteria that devoured it.

And only yards away, they found the first fossil evidence of a completely different kind of bacteria that scientists were unsure even existed as fossils that long ago.

The scientists suspect that the bacteria feasted on the dead arthropods, then absorbed minerals from their surroundings and turned to quartz, preserving perfectly the shape and texture of the arthropods.

The first find answers one of the most fundamental questions in paleontology—why some creatures fossilize even though they lack the mineral-rich bones, teeth, or shells that are normally required for the process.

The second find corroborates other evidence that a particular type of bacteria has a very ancient history on Earth.

Loren Babcock, professor of geological sciences at Ohio State, and his colleagues used a scanning electron microscope to examine fossils of tiny arthropods they collected from Antarctica and discovered that the arthropod fossils were actually composed of clumps of even tinier bacteria fossils.

"In essence, the bacteria self-fossilized and replicated the body of the animal," Babcock said.

They also examined limestone deposits found nearby and identified fossils of a different kind of bacteria called archaebacteria. Genetic studies of modern archaebacteria suggest this group has existed for billions of years. But fossil remains of archaebacteria have rarely been found, and never been found as fossils in Antarctica, until now.

The geologists presented their results at the Geological Society of America meeting in Denver. ❑

Searching For 'Ultima Thule': Part Two of Three

In Greenland's National Park

by Peter Skafte, Ph.D.

Photo by Galen Rowell, Mountain Light Gallery

Hikers in mist approaching Greenland's northernmost coast

My previous visit to Greenland's National Park (*The Polar Times*, 2004 Summer, Vol. 3 [5]:14-15) had taken me as far north as the 74th Parallel, still over a thousand kilometres (600 miles) from my goal of reaching the northernmost point of land. Nevertheless, I was not ready to give up. In the years that followed, I joined forces with two geologists from Colorado who shared my passion for North Pearyland. Every year I would lobby for permits with the authorities in Copenhagen, but we failed again and again to raise the necessary funds, which are exorbitant for this type of endeavor. We approached hundreds of companies and magazines. No one thought that our project had merit.

Finally, our luck changed. In July of 1996 the American Top of The World Expedition became a reality. The team consisted of nine men and one woman. We first flew from Iceland to Greenland, then followed Greenland's east coast north toward our dreams. Captain Johan Skirnison commanded our chartered Twin Otter. One thousand feet beneath us the inland ice cap was marked with emerald veins of melt water as if it were a live body. And where the glaciers met the long fingers of dark fjords, icebergs, like shining jewels, floated silently toward the sea. The grandeur and beauty was not lost on anyone in our group. The expedition's photographer, the late Galen Rowell, looked absolutely possessed as he raced from window to window aiming his camera at the land below.

Photo by Galen Rowell, Mountain Light Gallery

Hikers wading pools of water on the sea ice.

With my map, I tried to keep track of the features beneath me as we crept north along the curve of the earth. I recognized the long sweeping plains of "Hold with Hope," above the 73rd Parallel. Then, past the 74th Parallel, I saw Daneborg, where I had visited years before. At the 75th Parallel, Hochstetter Forland came into view, and at the 76th, the long, narrow Koldeway Island became visible a few miles off the mainland. The names on these features were chosen by the German/Austrian Koldeway Expedition back in 1870. Past the 77th Parallel, we landed for refueling at the small weather station called Danmarkshavn.

Eleven men were stationed here year-round in a few wooden buildings. The now legendary Denmark Expedition had chosen this location as the base camp for their exploration in 1906. Their little expedition house is still standing near the weather station. In those days, all of Greenland's coastal areas had been at least minimally explored, except the territory between Danmarkshavn and Cape Bridgman 400 miles to the north. Peary had explored the north coast of Greenland as far east as Cape Bridgman in 1900 while attempting to find the closest land route to the Pole. It was left for the Denmark Expedition, consisting of 28 men, to map and study the remaining unexplored area. At the time, it was an enormous task which involved 70 sled journeys. One of these journeys ended in tragedy. The expedition leader, L. Mylius-Erichsen, cartographer N. P. Hoegh-Hagen, and Greenlander Jorgen Brondlund died from starvation and frostbite after an attempt to map Independence and Danmarks Fjord. They had been delayed, lost their dogs, and were unable to reach Danmarkshavn before the long polar night set in. During their return journey, their boots simply wore off their feet. By some tragic oversight, they had forgotten to bring equipment to make new footwear out of skins. Brondlund was the last survivor in the group. He eventually managed to reach one of the expedition's depots on the coast before he died. Other members of the expedition, sent out to rescue the three men, found Brondlund's body in a tiny cave with his feet wrapped in rags. There was also a terse message saying:

> *Perished 79[th Parallel]—Fjord after trying to return home over the inland ice, in the month of November. I arrived here during waning moonlight, and could not go farther because of frostbite in the feet and because of the darkness. The others' bodies can be found in the middle of the fjord in front of the glacier (about 11.7 Miles). Hagen died November 15 and Mylius about 10 days later*—Jorgen Brondlund

Unfortunately, neither of the other two men's bodies, nor their maps and diaries, were ever recovered. Many have looked, but the Arctic wilderness has kept its secret for the last century.

As our plane continued north, I spotted Lambert Land above the 79th Parallel. It was here that Brondlund died. After the 80th Parallel, I saw the fearsome coast of Holm Land, and past the 81st Parallel, we flew across an enormous glacier called Flade Isblik. On the northwestern side of the glacier, near the 82nd Parallel, is Station Nord, the most northerly human habitation on Greenland's east coast. Our plane landed there on a well-maintained dirt runway. Station Nord consists of a number of wooden barracks. The station was built to serve the American Air Force during the cold war but has now been abandoned. Only three Danes stay here year-round. It is a godforsaken place. Old wires and other electronic junk that had once been used

Photo by Peter Skafte

The late Galen Rowell photographing a muskox skull on the way to the coast opposite Kaffeklubben Island, 1996.

to listen to the enemy, make mournful sounds now in the Arctic wind. Recently, an attempt has been made to clean up the environment, but the tracks from heavy vehicles across the tundra will leave their marks for hundreds of years.

We were allowed to camp in a one-room abandoned chapel with lots of pealing green paint. The idea was to continue north the next day, but a thick cloud cover had settled in over Pearyland, making flying impossible. Days went by without a change. Our pilot, Johan, and I passed the time discussing Icelandic Sagas. Other expedition members played pool and drank beer in the mess hall. Because the plane was needed back in Iceland, time was of the essence. Johan decided to make an exploratory trip to Pearyland to check out the cloud cover and landing possibilities. Only four passengers were allowed to accompany him. Later that day, Johan returned alone without his passengers. He had to leave them for safety reasons after landing in Citron Fjord 60 miles south of Greenland's north coast. Severe winds made takeoff too hazardous with passengers. Our expedition was in danger of being cancelled.

The next day, Johan decided to make a final attempt. If visibility and the snow cover proved acceptable, he would take us to Bliss Bay on the north coast, and then pick up the remaining expedition members at Citron Fjord. As we became airborne, low clouds completely covered the land. I was losing hope, but after we reached Greenland's north coast, Johan announced that the conditions were much better than he expected. The snow cover had melted and we would look for a possible landing site. A few minutes later we descended. The tundra raced towards us, the wheels touched the ground, but instead of landing, the nose of the plane rose, and we roared over the surrounding hills. Again and again we repeated the same maneuver. Our pilot was testing the solidity of the surface with his tires. Finally, I felt a series of hard bumps and the plane came to a stop in a small floodplain 300 metres from the Arctic Ocean.

We all leapt out of the plane, pale from the ordeal of landing, and unloaded our equipment hastily. Within minutes Johan flew south to pick up our stranded comrades. Two hours later he was back. All had been accounted for. Johan soared into the sky once again, dipped his wings, and, disappeared into the clouds. The immense gripping silence of Greenland settled upon us.

After setting up our camp, we studied the map. To reach Oodaag Island we first had to hike 11 miles west along the coast, then cross a mile and a half over sea ice to Kaffeklubben Island. From its summit we hoped that we would be able to see Oodaag less than a mile to the north.

Photo by Peter Skafte

Expedition members on the sea ice, 1996

It was a beautiful summer day in the Arctic when we began our hike. The sun was circling the sky. Our latitude, just over 6 degrees south of the North Pole, meant that the sun only rose six degrees higher at local noon (upon crossing the meridian to the south) than at local midnight (when crossing the meridian to the north). Small yellow Arctic Poppies nodded in the breeze among Purple Saxifrage. An occasional bumblebee would hurry from flower to flower. After all, they only had a few weeks to get on with their lives. Along our route were skeletons of musk oxen slowly sinking into the tundra. Their bones were silent testimony to ancient battles with wolves. Even now, perhaps hundreds of years after their deaths, the nutrients leaching from their bones gave life to tufts of grass and flowers.

We camped on the coast south of Kaffeklubben Island. Next day we discovered that the sea ice had melted on the surface and formed huge pools surrounded by soft snowdrifts. This was not going to be easy. After testing the situation, it became clear that we needed our plastic snowshoes with steel cleats. Without them we would be floundering in the snow drifts and slipping in the pools. We also needed more food and a small inflatable raft, just in case we encountered a lead in the ice. Unfortunately, all these things were back at our base camp. Five of us volunteered to make the 22-mile roundtrip.

A day later we tried the crossing again. The farther away from the coast we walked, the deeper the pools became. Now, I understood why the arctic explorers feared the melting ice. Their clothing and shoes insulated them from cold air and snow, but not from icy water. Our equipment was also inadequate for this environment. In my own case, I was wearing tennis shoes inside light stretch boots. Eventually, as the pools became deeper my boots filled up with ice water and I soon lost all feeling in my feet.

After a couple of hours we reached Kaffeklubben Island[1], which looks like a gigantic stranded whale about two thirds of a mile (1 km) long. Even on these bare windswept slopes, flowers cling to the gravel. Out of curiosity I walked to the northern tip of the island to locate the world's northernmost individual flower. It was a Purple Saxifrage, only an inch tall, yet a conqueror here at the edge of the world.

From the top of Kaffeklubben we began scouting for Oodaag Island with binoculars, but all we saw was an endless expanse of melting sea ice. Three expedition members went to check out a dark spot in the ice about half a mile away. It proved to be nothing but an unusual shadow.

Now, everyone had his own ideas about where to look. We spread out north and east of the island. Here, the pools on the melting sea ice became deeper, and we had to walk long distances to avoid getting soaked. Only Galen Rowell seemed indifferent to the deep pools, which he charged through like a polar bear. I remember thinking, "He is not going to last long that way," when the edge of a snowdrift gave away underneath me and I plunged into four feet of water. My feet, strapped to snow shoes, slid out from under me, and for a few seconds I was flopping about like an injured duck. I became drenched from head to toe. Fortunately, one of my team members loaned me an extra pair of fleece pants.

Our search for Oodaag Island continued, but the icy water was taking its toll. Galen became too cold to continue and walked back to our camp. If I didn't follow his example, my feet would suffer lasting damage. I had just started walking back when I heard jubilant shouts from a quarter mile away. It could only mean one thing. Oodaag Island had been found. This I couldn't miss. I turned around and made a beeline for the elusive island. My path took me through waist deep water, but I no longer cared. Soon I spotted some of our expedition members gathered around a small rock sticking out of the middle of a large pool. Inches under the water line I could see the rock was surrounded by gravel. A nearby snowdrift turned out to be the larger part of the island covered with a thin layer of snow. In this environment it was pure luck to find anything. We could have walked across several islands without seeing them because of the snow cover.

Standing in a pool of water in the Arctic Ocean we now held a most unusual celebration. Someone had packed a bottle of champagne. We made many toasts, posed for pictures and acted like delirious children. But these happy memories seem insignificant in comparison to the moment I picked up my own magic stone, a small piece of the Ultima Thule. ❑

Photo by Galen Rowell, courtesy Mountain Light Gallery

Muskox skull with Arctic poppies, fisheye lens.

Editor's Note: *Dr. Skafte's story will conclude with Part Three in the July 2005 issue of* The Polar Times.

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[1] The first to determine that part of Kaffeklubben Island is located farther north than Cape Morris Jessup was a Canadian/American team for Project Nord in 1969. The team included R.L. Lillestrand, E. F. Brown, E. R. Niblett and J. R. Weber. The previous installment of this series may have left the impression that this determination was made in 1978, when Oodaag Island was discovered.

Perceiving Climate Change in the Arctic

by Heidi Steltzer

Golfing in Greenland on the 4th of July

Tourism in the Arctic is on the rise. Many of us are traveling to the landscapes of the Far North—66 degrees and 32 minutes north latitude and beyond. We head there with a set of expectations for pristine landscapes, herds of caribou, sea mammals, icebergs, and cold temperatures. These are certainly reasonable expectations, ones based on images we have seen of the Arctic in photos or films, and on stories we have read or heard. A new story has been added over the years though—one of climate warming in the Arctic.

> *We head there with a set of expectations for pristine landscapes, herds of caribou, sea mammals, icebergs, and cold temperatures.*

Many Arctic-bound travelers have changed their expectation of cold temperatures to one of warm temperatures based on the reports of global warming. The weather they experience during their one- to two-week trip in the Brooks Range of Alaska, the Canadian Arctic Archipelago, or on the coast of Greenland, confirms or repudiates global warming for them. Is this a reasonable outcome from a trip to explore the Arctic? Can we perceive climate change?

Our understanding of climate often does come from our experiences. Anyone who has traveled to the mountains establishes an awareness of how much colder it can be in the mountains than in the nearby plains. Sometimes this lesson is learned by needing to buy a new sweatshirt, just like the ones you have at home but didn't bring, while on a sightseeing trip to Rocky Mountain or Yosemite National Park. Colder mountain temperatures are a result of decreased air density with elevation. Basing one's understanding of mountain climate on a trip to the mountains is reasonable. Similarly, expecting colder temperatures in the Arctic relative to where one is from in the continental U.S. is logical. It is the energy from the sun that warms the atmosphere, and solar energy inputs decrease with increasing latitude as a result of the decreasing angle of the sun.

The experience of cold or warm days during a summer's trip to the Arctic or a year's stay, however, cannot be used to confirm or deny global warming. Even a 10-year stay would not be sufficient. Reports of warming in the Arctic utilize data from 50- to 100-year records of air temperature and paleo-records, such as tree rings, lake sediments, and ice cores, that provide data on past air temperature for 100s to 1000s of years. Scientists agree that the Arctic has warmed, but most of us have not lived in the Arctic long enough to be able to perceive climate change there.

As an Arctic researcher who has spent four summers living in the Arctic, I have a desire to use the experiences I have had there to communicate an understanding of climate change. In thinking about our ability to perceive climate change, however, I realize that my experiences can only be used to tell a story of interannual climate variation. Year to year variation in climate is what I have experienced. During my first summer in the High Arctic at 76 degrees north,

> *The experience of cold or warm days during a summer's trip to the Arctic...cannot be used to confirm or deny global warming.*

a mere 900 miles from the North Pole, I played golf in khakis and a long-sleeve T-shirt on the 4th of July. During my second tour of duty at Thule Air Base the following summer, I rarely took off my down coat, and 4th of July entertainment required a more active sport—ultimate Frisbee—to stay warm.

One of my favorite stories about tourist's expectations of the Arctic is of a couple who headed to Kotzebue, Alaska to see igloos in July. They thought that the Arctic was a landscape covered by snow year round. Despite the lack of snow in town and the repeated denial of igloos in July by a local bush pilot, the couple proceeded to schedule a flight to an Inuit village out on the Kobuk River. No igloos appeared on that hot July day, unusually hot in fact, but plenty of Inuit, who had lived in the Arctic their whole lives, were waterskiing on the river. Based on a lifetime living in the region, they knew that another day that warm was not likely to take place again for awhile. ❑

Heidi Steltzer is a research scientist in the Natural Resource Ecology Laboratory at Colorado State University

Climate Experts Respond to Arctic Climate Impact Assessment

Recent warming trend is unexceptional compared to natural variability in centuries past

***PRNewswire,* WASHINGTON, 16 November 2004**—Today 11 climate experts sent a letter to Senator John McCain (R-AZ) who is the Chairman of the Senate Commerce, Science and Transportation committee and is holding a full committee hearing this morning to hear testimony on the Arctic Climate Impact Assessment (ACIA).

In the letter, the climate experts respond to statements made in the ACIA that temperature changes in the Arctic provide an early indication of global warming. The signers of the letter point out that sediment and ice core samples show that the Arctic has experienced past warming that cannot be attributed to greenhouse gas concentrations. There is also a history of strong year-to-year variability of Arctic temperatures. The letter also calls for the need for advances in Arctic climate science in both models and measurements in order to assess a more complete picture of Arctic climate understanding.

The following climate experts signed the letter: R. Tim Patterson, PhD, Professor of Geology at Carleton University; Tim Ball, PhD, Retired, Professor of Climatology at University of Winnipeg; Anthony Lupo, PhD, Professor of Atmospheric Science at University of Missouri - Columbia; David Legates, PhD, Associate Professor in Climatology at University of Delaware; Pat Michaels, PhD, Professor of Environmental Sciences, University of Virginia; George Taylor, M.S. Meteorology; Gary D. Sharp, PhD Scientific Director, Center for Climate/Ocean Resources Study; Roy W. Spencer, PhD Principal Research Scientists, The University of Alabama in Huntsville; Jon Reisman, Associate Professor of Economics and Public Policy; University of Maine at Machias/Maine Public Policy Institute Scholar, Willie Soon, PhD, Science Director, Tech Central Station and Sallie Baliunas, PhD, Enviro-Science Editor, Tech Central Station. ❑

Paleoceanography: Signs of a Warm, Ice-Free Arctic

***Science*, Vol. 305, 17 September 2004, by Richard A. Kerr (American Association for the Advancement of Science)**—Drillers returned to Tromsø this week with sediment cores from the first holes ever drilled into the deep, ice-covered Arctic Ocean. The cores contain evidence of a dramatic defrosting of the Arctic Ocean near the North Pole 55 million years ago and a long, slow slide toward the perennial ice cover of recent times. Somewhere in the hundreds of metres of mud cored should be a record of the last ice-free Arctic summers of millions of years ago, conditions that may return in the greenhouse world of 2100.

The deep-drilling success of the $12.5 million Arctic Coring Expedition (ACEX) comes after decades of merely picking at the upper few metres of Arctic seafloor sediments. Since the 1960s, scientific ocean drilling in other seas has returned 160 kilometres of rock and sediment cores. But scientific drill ships had to flee at the sight of ice, and in the Arctic only the top few metres of sediment could be sampled through the oceanwide ice.

Now, under the new Integrated Ocean Drilling Program (*Science*, 18 April 2003, p. 410) the 13-member European Consortium for Ocean Research Drilling has fielded a three-ship flotilla: an ice-reinforced drill ship to float 1300 metres above the drill hole plus two icebreakers—one of them nuclear-powered. At the drill sites, just 220 kilometres from the North Pole, ice as much as 4 metres thick covered the surface, usually with only a few gaps. Despite a string of mechanical breakdowns—a crucial high-pressure pump valve broke three times—the ships were equal to the task. "We found that even in heavy ice conditions, we could stay [over the same hole] as long as 8 days," says Kate Moran of the University of Rhode Island, Narragansett, who with Jan Backman of Stockholm University in Sweden was an ACEX co-chief scientist. "We can probably go any place in the Arctic Ocean and drill."

> *"We can probably go any place in the Arctic Ocean and drill."*

In three weeks of drilling operations, ACEX bored through all 410 metres of sediment at one site on the underwater Lomonosov Ridge and drilled to shallower depths in five other holes. All told, the 19 shipboard scientists from eight nations gathered a total of 339 metres of sediment as old as 80 million years.

Their biggest find was a couple of hundred thousand years' worth of sediment from 55 million years ago. It contains animal and plant microfossils typical of 20°C subtropical waters, not the subzero waters of today. The fossils mark the so-called Paleocene-Eocene Thermal Maximum (PETM) recorded around the globe in marine sediments of the time. "Getting the PETM was a fabulous result," says Moran. Seismic probing at the site had suggested that sediments of PETM age were missing there.

Now, paleoceanographers can try to sort out the Arctic Ocean's role in the PETM. The warming seems to have been triggered by a massive release of methane, a greenhouse gas, stored beneath the sea floor as an icy hydrate (*Science*, 28 January 2000, p. 576). It's unclear what drove the methane release, but a geochemical peculiarity of the ancient Arctic might have been involved. ACEX scientists found strikingly low Arctic seawater salinities during most of the past 60 million years, due partly to large influxes of river water. Such low-density waters might have altered ocean circulation globally if they leaked into the Atlantic, Moran notes.

Once global Eocene warmth began to wane the world was on its way toward the deep chill of the past few million years. The first sure signs of Arctic ice—bits of sand that must have rafted to mid-ocean in one-time grounded ice—appeared in 40-million-year-old sediments. That's earlier than some scientists had expected. Seven million years ago, the delivery of the ice-borne sand picked up sharply, suggesting more and possibly year-round ice. But pinning down when Arctic summers last saw ice-free waters—a condition global warming might bring on by the end of the century—will require close inspection of the cores on shore, says Moran. She can hardly wait. ❑

Stevens Cool To Conclusion of Global Warming Study

***Associated* Press, ANCHORAGE, 18 November 2004**—U.S. Sen. Ted Stevens, R-Alaska, says he disagrees with a new scientific study's conclusion that the burning of fossil fuels is a major factor in climate change.

The study by the Arctic Climate Impact Assessment was commissioned by an international commission with representatives from eight countries, including the United States, as well as six indigenous groups. Scientists who helped put together the report briefed members of the U.S. Senate Commerce Committee on Tuesday. Stevens, who is to chair the committee starting in January, agreed that climate change is a serious problem and said he looked forward to reading the report. But he said he does not accept the conclusion the scientists reached: that the driving force behind warming is people burning coal, oil and natural gas, the fuels that produce greenhouse gases that trap heat in the atmosphere. Stevens said there would be differences of opinion on what to do about the problem. "But I don't think there are going to be any differences of opinion that this change is taking place and we need to take some action," Alaska's senior senator said.

Stevens' spokeswoman, Courtney Schikora Boone, said the action Stevens is taking is to fund more research about climate change. "If you look back at the history of the globe, there's been so much cyclical global change. We want to make sure whether it is cyclical or solely manmade or if it is both," Boone said.

> *Scientists say trying to slow the progress of global warming "...is like putting the brakes on a supertanker."*

That approach is at odds with Stevens' fellow Republican, Arizona Sen. John McCain, who argued that a mountain of scientific evidence points to the burning of fossil fuels and that immediate action was needed to curb greenhouse gas emissions. "Unless we address them, the people in Arizona are going to have the same problem as the people in Alaska face today," McCain said at the Tuesday hearing.

The Alaska Arctic is now warming at up to ten times the rate of the rest of the planet, wrecking villages, melting glaciers and threatening the extinction of polar bears and ringed seals, the scientists told the committee. Remote Alaska is at the center of the debate as a result of the scientists' conclusion that the Arctic is the first to feel effects that will be global. One reason is that when snow and ice melt, the exposed, bare ground absorbs more heat. "If you live in Alaska or you live in the Arctic, the things that are happening are of profound importance," said Robert Correll, a senior fellow with the American Meteorological Society and leader of the scientific team that produced the report. Greenhouse gases remain in the atmosphere for 100 years, Correll said. So it will be difficult to slow the progress of global warming. "It's like putting the brakes on a supertanker," he said.

About 300 scientists participated in putting the study together, including scientists from Alaska. "The strength of the trends and the patterns of change that have emerged in recent decades indicate that human influences, resulting primarily from increased emissions of carbon dioxide and other greenhouse gases, have now become the dominant factor," it says. The Arctic Council will meet next week in Iceland to consider what to do about climate change. President Bush has opposed curbing greenhouse-gas emissions, arguing that the science is not clear and it would hurt the economy. ❑

Archaeology in Inglefield Land, Greenland

by Genevieve LeMoine

Photo by Genevieve LeMoine

Pauline Knudson, a graduate student at the University of Tromsø, maps a tent ring on a blustery evening at Cape Grinnell.

Located at the northern end of the North Water polynya, stretching from Cape Alexander to the Humboldt Glacier, Inglefield Land has been an attractive place for maritime hunters to live for millennia. In the recent past, it was home to Inughuit communities and the headquarters of many exploration expeditions. In the more distant past, the region was the "Crossroads to Greenland" because groups could readily cross Smith Sound from Ellesmere Island in the Canadian Arctic to Greenland.

This region is an ideal place to study questions of culture contact in the archaeological record, for two reasons. First, the Inughuit (formerly known as the Polar Eskimo) were first contacted by Europeans relatively late, in 1818. At that time they were portrayed as the most isolated people in the world. This changed in the mid-nineteenth century when a number of expeditions visited the area, resulting in a rich historical record of contact. Second, the complexity of the contact situation was increased when a group of Inuit from Baffin Island arrived in the 1860s. These new migrants settled among the Inughuit, married into the community, and reintroduced forgotten technologies such as kayaks and bows-and-arrows. By identifying and studying archaeological remains spanning the eighteenth and nineteenth centuries, we endeavor to understand how Inughuit communities reacted to the newcomers in their land.

One key feature that made Inglefield Land attractive to people is the North Water polynya because of the marine life it attracts, including seals, walrus, and dozens of species of sea birds. However, the polynya is sensitive to changing climate, which affects the extent and duration of the open water, and in this extreme northern environment such changes can have a dramatic impact on animal populations and on the humans who rely on them. Archaeological research in neighboring parts of Ellesmere Island suggests that the whole region may have been abandoned for long periods, particularly during cold stages. We hope to understand how people reacted to periods of cooling and warming in the past by examining the complex interplay between culture contact and climate change within its historical context.

> *At Cape Grinnell...we found evidence of habitation dating from recent times to at least 4000 years ago....*

This past summer, we initiated two related projects. Trine Johansen, a UC Davis graduate student, spent three weeks in the community of Qaanaaq interviewing hunters about their experiences in Inglefield land, asking where and what time of year they had hunted and what species they had pursued. These interviews, and the maps generated from them, will help guide the archaeological survey, as well as interpret the results and link them to contemporary land use. Meanwhile, the crew began a six-week survey of two areas on the central coast of Inglefield Land, first in Force Bay and then Marshall Bay. Like many previous expeditions to the region we were hampered by weather conditions—fog prevented us from using a helicopter to do a preliminary broad regional survey, and ice conditions impinged use of our small boat. We mainly relied on an intensive foot-based survey, which proved to be remarkably effective.

> *Inglefield Land has been an attractive place for maritime hunters to live for millennia.*

We identified and mapped nearly 800 archaeological features this past summer. Indeed, virtually everywhere we looked that could support human occupation had evidence of past use. We identified a variety of architectural features, including nearly 300 tent rings and 16 semi-subterranean winter houses (this number does not include the many similar houses excavated by Danish Archaeologist Erik Holtved at the site of Inuarfigssuaq in Marshall Bay in the 1930s), and a wide variety of other types of features, such as meat caches, fox traps (which might indicate environmental change given that foxes are nearly absent in the area today), kayak and umiak stands used to keep skin boats up out of harm's way, and human burials. Based on the style of architecture and artifacts, plus the features' elevations of above sea level, it is clear that whole range of 4500-year human occupation of the High Arctic is present in Inglefield Land.

One of the highlights of our summer was a site at Cape Grinnell, located at the northern end of Force Bay, where we found evidence of habitation dating from recent times to at least 4000 years ago and documented over 100 features representing nearly every type of dwelling known in the High Arctic. We also believe this site was initially visited by American explorer Elisha Kent Kane in the 1850s.

Despite problems with weather and the inevitable logistical headaches associated with working so far from a support base, our first field season was very rewarding. Next summer we will return, this time focusing on the northern coast and the inland area around the September Lakes, a region identified as important by hunters in Qaanaaq. Following that, we will evaluate our results and identify sites where careful excavation can help us understand the roles culture contact and climate change played in shaping Inughuit culture. ❑

The Inglefield Land archaeology project (ILAP) is a long-term archaeological research project led by Christyann Darwent of the University of California, Davis, and Genevieve LeMoine of The Peary-MacMillan Arctic Museum, Bowdoin College. It is funded by the National Science Foundation's Office of Polar Programs, in collaboration with the Greenland National Museum and Archives in Nuuk, and the Thule Museum in Qaanaaq.

Report Gauges Arctic Warming Trend

***New York Times,* 30 October 2004, by Andrew C. Revkin**—A comprehensive four-year study of warming in the Arctic shows that heat-trapping gases from tailpipes and smokestacks around the world are contributing to profound environmental changes, including sharp retreats of glaciers and sea ice; thawing of permafrost; and shifts in the weather, the oceans and the atmosphere.

The study, commissioned by eight nations with Arctic territory, including the United States, says that the changes are likely to harm native communities, wildlife and economic activity but also to offer some benefits, such as longer growing seasons.

The report is to be released Nov. 9, but portions were provided yesterday to *The New York Times* by European participants in the project.

While Arctic warming has been going on for decades and has been studied before, this is the first thorough assessment of the causes and consequences of the trend. It was conducted by almost 300 scientists, as well as elders from the native communities in the region, after representatives of the eight nations met in October 2000 in Barrow, Alaska, amid a growing sense of urgency about the effects of global warming on the Arctic.

The findings support the broad but politically controversial scientific consensus that global warming is due mainly to rising atmospheric concentrations of the heat-trapping "greenhouse" gases. While the report is advisory and carries no legal weight, it is likely to increase pressure on the Bush administration, which has acknowledged a possible human role in global warming but says the science is still too murky to justify mandatory reductions in greenhouse-gas emissions. The State Department, which has reviewed the report, declined to comment on it.

The report says that "while some historical changes in climate have resulted from natural causes and variations, the strength of the trends and the patterns of change that have emerged in recent decades indicate that human influences, resulting primarily from increased emissions of carbon dioxide and other greenhouse gases, have now become the dominant factor."

The Arctic "is now experiencing some of the most rapid and severe climate change on Earth," the report says, adding, "Over the next 100 years, climate change is expected to accelerate, contributing to major physical, ecological, social and economic changes, many of which have already begun."

Scientists have long expected the Arctic to warm more rapidly than other regions, partly because as snow and ice melt, the loss of bright reflective surfaces causes the exposed land and water to absorb more of the sun's energy.

The report says that the effects of warming may be heightened by other factors, including overfishing, rising populations and rising levels of ultraviolet radiation from the depleted ozone layer, a condition at both poles.

"The sum of these factors threatens to overwhelm the adaptive capacity of some Arctic populations and ecosystems," it says.

Prompt efforts to curb such emissions could slow the pace of change, allowing communities and wildlife to adapt, the report says. But it also stresses that further warming and melting are unavoidable, given the century-long buildup of the long-lived gases, mainly carbon dioxide.

Several of the Europeans who provided parts of the report said they did so because the Bush administration had delayed publication until after the presidential election.

But Gunnar Palsson of Iceland, chairman of the Arctic Council, the international body that commissioned the study, said yesterday that there was "no truth to the contention that any of the member states of the Arctic Council pushed the release of the report back into November." Besides the United States, the members are Canada, Denmark, Finland, Iceland, Norway, Russia and Sweden.

Palsson said all of the countries agreed to delay the release, originally scheduled for September, because of conflicts with another international meeting in Iceland.

Dr. Robert W. Corell, an American oceanographer directing the assessment, said he could not yet comment on the specific findings.

"The major message is that climate change is here and now in the Arctic," he said.

The potential benefits of the changes include projected growth in marine fish stocks and improved prospects for agriculture and timber harvests in some regions, as well as expanded access to Arctic waters. But the list of potential harms is far longer.

The retreat of sea ice, the report says, "is very likely to have devastating consequences for polar bears, ice-living seals and local people." Oil and gas deposits on land are likely to be harder to extract as tundra continues to thaw. ❑

Editor's Note: *The 144-page overview report, graphics, and spokesperson contact information for the "Arctic Climate Impact Assessment" are available for download from the ACIA on-line press room, http://www.acia.uaf.edu; radio actuality available at 703-418-2060.*

Ice Clarifies Climate's Secrets: *Life signs found deep in frozen Greenland*

***USA Today,* NORTH GRIP, Greenland, 31 August 2004, by Jack Williams**—Possible plant material and pink ice found at the bottom of the ice sheet under this wind-swept camp could give scientists an unprecedented look at life that has perhaps survived for a million years or more.

No matter what any plant material and mud end up revealing, researchers already are reading the story the ice tells about the last 120,000 years of Earth's climatic ups and downs.

The signs of life and the climate data are being studied by a small group of men and women who have worked summers since 1996 at the North Greenland Ice Core Project camp.

They have extracted ice cores one at a time from the top to bottom of the 10,121 feet of ice. Each core cylinder is 4 inches in diameter and 11 feet tong

At the bottom of one core, there is a piece of material that looks like a pine needle, which could mean "a pine tree got run over by a glacier ... showing the climate cooled rapidly at the start of an ice age millions of years ago," says James White of the University of Colorado.

The pink ice is from water that re-froze after being melted by geothermal heat.

White says color in the "watermelon ice" looks like protozoa that live in snow in many parts of the world. The protozoa give the ice the red color. "My guess is that it's an active, living colony.

"Life at the bottom of an ice sheet is a pretty big thing" but not a complete surprise, White says.

Living microbes have been found in Antarctic ice, but this would be the first discovered in Greenland.

Previous research already has shed light on the ice age that lasted 100,000 years and ended about 10,000 years ago. The cores show that this ice age started with much milder and fewer climate swings than those that marked its end, confirming findings from cores taken from Antarctic ice and ocean-bottom sediment.

But more important, the ice cores show at least one temperature swing that interrupted the slide into the ice age, White says. This could be important to understanding what Earth's climate is now doing since it has been generally stable for 10,000 years. Research is showing that a significant temperature swing is not out of the question even in periods of steady change.

During a 50-year period about 115,000 years ago, the average temperature shot up 9 degrees Fahrenheit and then dropped as Earth resumed its slide into the ice. Nine degrees might not sound much, but if something similar happened today, it would be quite noticeable.

This abrupt change shows "there's something in the climate system that allows for relatively large changes of climate in a relatively short time," even without the temperature variations that can result when large sheets of ice start melting as at the end of an ice age, White says.

The ice from the ice age stretched as far south as what is now the northern USA. Melting of large ice sheets almost surely disrupted global ocean currents, probably causing the abrupt swings in global temperatures that occurred between 11,000 and 15,000 years ago.

"To know abrupt changes can occur as the ice sheets are forming, shows they can occur during any climate," White says. ❑

Under All That Ice, Maybe Oil

Photo by Martin Jakobsson

Last August, three icebreakers moved into position to extract the first deep cores of sediment beneath the drifting ice cap in the Arctic Ocean near the North Pole.

New York Times, **"Science Times," 30 November 2004, by ANDREW C. REVKIN—** The ice-cloaked Arctic Ocean was once apparently a warm, biologically brewing basin so rich in sinking organic material that some scientists examining fresh evidence pulled from a submerged ridge near the North Pole say the seabed may now hold significant oil and gas deposits.

This is just one of many findings from a pioneering expedition that in late summer sent dozens of scientists and technicians on three icebreakers—one with a drilling rig nine stories tall—into the drifting, crunching plates of sea ice to retrieve the first long-term record of climate and ocean conditions there. The expedition drilled 1,400 feet deep, retrieving cores of sediment that, with some gaps, span 56 million years. Scientists from around the world gathered in Bremen, Germany, this month to analyze the samples.

They hope that a better understanding of how Arctic climate has varied over the millenniums will help them project the implications of the region's recent warming trend, which many scientists have concluded has mainly been propelled by emissions of carbon dioxide and other heat-trapping gases.

Just retrieving the samples was "a technical *tour de force*," said Dr. Richard B. Alley, an expert on Arctic change at Penn State.

And the initial findings are already upending old notions, among them that the Arctic Ocean lacked sufficient sediment and biological activity to record past conditions in its bed.

"Everyone thought this ocean basin was starved of sediment," said Dr. Kathryn Moran, an oceanographer at the University of Rhode Island who was a co-leader of the 14-nation project. "We've already knocked that ball out of the park."

So far, the coring project has mainly garnered the attention of climate experts, but word is slowly spreading among geologists focused on oil as well.

Petroleum deposits are already charted along the shallow shelves fringing the Arctic from the North Slope of Alaska to northernmost Europe. But the cylinders of dark, ancient rock extracted from the submerged mountain range, the Lomonosov Ridge, are the first hint that such deposits may lie in the two-mile-deep basins near the top of the world.

The cores provide the first evidence that vast amounts of organic material created by plankton and other life settled on the seabed, experts say. That kind of carbon-rich accumulation is a vital precursor to the formation of oil.

Some of the deepest, oldest, most carbon-rich layers, dated to around 55 million years ago, formed during a period called the Paleocene-Eocene Thermal Maximum, when the world was running a raging temperature. Scientists believe that this relatively brief period, far warmer than the present, was caused by a spike in heat-trapping greenhouse gases far greater than the human-caused buildup that has occurred over the last century.

The cause of the warming was a vast release of submarine deposits of frozen methane, a powerful greenhouse gas, but scientists do not yet know whether the methane was liberated by volcanic activity, a shift in warm sea currents or some other force.

About 49 million years back, with the climate cooling and the atmosphere's greenhouse burden declining, the retrieved shafts of sediment also speak of an extraordinary, short-lived era of several hundred thousand years when so much warm fresh water apparently topped the Arctic's oxygen-starved, salty depths that the polar sea became matted with tiny Azolla ferns, resembling the duckweed that can choke suburban ponds.

Altogether, about 600 vertical feet of sediment from the ridge is rich dark organic material, implying that there could easily be two vertical miles or more of similar organic layers in the deeper adjacent basins, said Dr. Henk Brinkhuis, a geobiologist from Utrecht University in the Netherlands who participated in the coring project.

If subsequent accumulations of sandstone and clay formed the appropriate lid, the deeper material could have cooked into oil or gas, he said. He stressed that this remained "crude speculation" until more surveying was done. But with demand for oil skyrocketing and known reserves dwindling, even the subtlest hint is significant.

"This could indeed be a promising sign for oil and gas prospectivity in the Arctic Ocean," said Prof. Harry Doust of the Free University of Amsterdam, who is a former exploration geologist for Shell.

He, too, stressed that more drilling would be needed before anyone could contemplate an eventual oil boom in the deepest Arctic. "Nevertheless, oil prospectors will be very excited," he said, "and will be watching the results of analyses with keen interest."

> *"Everyone thought this ocean basin was starved of sediment....We've already knocked that ball out of the park."*

Already, under a provision in the Law of the Sea Treaty, Denmark, Russia and other countries with Arctic territory are sending out mapping expeditions aimed at expanding their seabed claims. The United States, under pressure from some conservative Republican senators who oppose many such international compacts, has not ratified the treaty. But new American Arctic surveys are planned, in part on the presumption that the United States will ratify the treaty soon.

For the moment, any long-term implications of the research for oil markets are secondary to the scientific value of the cores, Arctic experts said.

The preliminary analysis reveals that the Arctic Ocean has been constantly icy for at least 15 million years, far longer than scientists had previously theorized. Dr. Moran said scientists had

previously put the last ice-free conditions at four million to seven million years ago.

Experts involved in the work said these findings added sobering context to today's Arctic warming trend, which climatologists have linked to accumulating greenhouse gas emissions and say could lead to a largely ice-free sea in summers this century.

No one expects ferns to cover the polar sea anytime soon, but some experts involved with the research said the recent changes in the Arctic could result in a long-lasting warming that is likely to change the nature of the Arctic profoundly, for better and worse. In outlining the pattern of change during and after the last big Arctic warm-up, 55 million years ago, the new cores show "you can get a really strong cascade" toward warming that can then take hundreds of thousands of years to reverse, said Dr. Brinkhuis.

Whatever the future holds, it is becoming clearer with every new scientific poke at the freshly recovered shafts of layered shale, microscopic plankton fossils, pebbles and other material that the coring project will provide an unparalleled view of past climate changes at the top of the world, Arctic experts said.

"This information will be extremely valuable for placing the recent observations of Arctic change in the proper context," said Dr. Peter Schlosser, who is not involved with the project but is the current chairman of the National Science Foundation's Study of Environmental Arctic Change and a researcher at Columbia. The coring expedition took a decade to plan and grew out of a series of seismic surveys, starting in 1991, that bounced sound waves more than 1,000 feet into the Lomonosov Ridge and pictured the kind of layer cake striations that can reveal climate and ocean history. The ridge, four Eiffel Towers deep, was chosen instead of the deeper sea floor in part because such features—rising as high above the seabed as the Alps rise over Europe—tend to accumulate the neatest layers of deposited debris over time, without slumping and other movement that can scramble geological evidence elsewhere, Dr. Moran said.

The sediment layers on a ridge also tend to present a compressed version of geological and climatic history, like a *Reader's Digest* condensation of a novel, meaning that a core need not penetrate deeply to capture the whole story, some of the researchers said.

The $12.5 million project was conducted under the auspices of the Integrated Ocean Drilling Program, which is coring sea beds around the world to reveal geological history.

From mid-August through early September, two icebreakers ran interference for the vessel with the drilling rig on its deck, trying to fend off the thickest floes so the drillers could remain motionless while bringing up dozens of shafts of ever-deeper sediment in sections 15 feet long.

While the greatest concern had been defeating the ice, the main impediment to getting samples was a lack of certain equipment and fairly mundane breakdowns, scientists on the project said. ❑

Petroleum From Decay? Maybe Not, Study Says

Long-dead plant matter may not be the world's only source of hydrocarbons. Twelve miles or more beneath its surface, in hellish temperatures and under pressures 50,000 times that at sea level, the earth itself may be generating methane, say researchers who have squeezed common rock and water together to reproduce these conditions.

The discovery bears on a longstanding argument about the source of petroleum and whether deposits are generated by rotting vegetation or by inorganic processes. "If the answer turns out to be inorganic, this has huge implications for the ecology and economy of our planet as well as for the chemistry of other planets," said the physicist Dr. Freeman Dyson, of the Institute for Advanced Study at Princeton, in a written comment, adding that the new work showed how to do experiments that will tackle the question. Most experts agree that commercially significant oil and gas deposits are biological in origin.

The finding was made at the Geophysical Laboratory of the Carnegie Institution of Washington, a leader in studying geology at high pressures, and is being reported today in The Proceedings of the National Academy of Sciences. It was conducted by a team led by Dr. Henry Scott, now at Indiana University.

Dr. Scott said the work was inspired by the writings of Dr. Thomas Gold, a maverick astrophysicist who spun off a stream of brilliant ideas, many of them correct, before his death in June. In the still undecided category remains Dr. Gold's thesis that hydrocarbons are an abundant natural constituent of the earth that constantly seep to the surface; petroleum deposits only seem to be biological in origin, he suggested, because they are contaminated with materials made by a subsurface kingdom of chemical-eating microbes.

Several aspects of Dr. Gold's thesis have been corroborated, including the discovery of the subsurface microbes as well as certain sources of methane gas that are clearly not biological.

To check another aspect of Dr. Gold's thesis, Dr. Scott took marble and water, with iron oxide as a catalyst, and put them in a diamond anvil cell, a device for studying materials at extremely high pressures. He found that at pressures corresponding to those some 12 miles beneath the earth's surface, the water disintegrated, and its hydrogen atoms joined the carbon atoms in the marble rock to form methane.

"This work suggests that natural gas, which people in the West have assumed is primarily biological in origin, may not be so much so," said Dr. Dudley Herschbach, a Nobel Prize7-winning chemist at Harvard and a co-author of the study. "I think all of this will lead people to take Tom Gold more seriously than many were inclined to."

Dr. Barbara Sherwood Lollar, a geologist at the University of Toronto, said the finding that methane can be generated in the earth's mantle was important and "a missing piece of the story." Dr. Lollar studies deep subsurface microbes on behalf of NASA, which is interested in the possibility of microbial life beneath the surface of Mars and other planets.

Dr. Lollar has developed an isotope-based method for testing whether hydrocarbons have been made inorganically or through the heating of organic matter. Some of the hydrocarbon emissions tested were inorganic, but most were of biological origin.

Inorganic methane generation is much more of a worldwide phenomenon than had been supposed, she said, but the quantities produced are probably diffuse, compared with the rich deposits of biologically generated hydrocarbons.

Dr. Scott and his colleagues say their finding about the generation of methane "has broad implications for the hydrocarbon budget of the planet."

The researchers plan to see if more complex hydrocarbons, like ethane and butane, can be generated at the higher pressures deeper in the earth.

Their data was analyzed by scientists the Lawrence Livermore National Laboratory which, because of its work on the thermodynamics of nuclear weapons, is familiar with the intense pressures and temperatures found deep in the earth. ❑

Canada Reinforces Its Disputed Claims in the Arctic

New York Times, **PANGNIRTUNG, Nunavut, 24 August 2004, by Clifford Krauss**—Hundreds of Canadian troops were all around. Helicopters swooped over the tin roofs of this isolated hamlet. A navy frigate and coast guard icebreaker were moored and readied in a nearby fjord. Across the bay, Master Cpl. Carl Gale was doing his part, too, as he introduced himself to an Eskimo family out picking wild blueberries.

"I suppose you know we are up here for training," he told Aluki Metuq, 31, and her four children, and then asked if they had seen any of the mock satellite debris his unit was hunting for. They had not. But the troops and their Eskimo Ranger guides gathered in a field of flowering moss anyway to join them for a snack of berries and a friendly chat before the patrol resumed.

The show of force, coupled with efforts to win over local people, showed how far the Canadian military was willing to go to familiarize itself with an increasingly valued region where it seldom operated while strengthening Canada's claim to it.

The $4 million exercise is the most prominent sign to date of Canada's intensifying effort to reinforce disputed claims over tens of thousands of miles of Arctic channels and tundra. Once nearly permanently frozen, forbidding and forgotten, the region is today seen by officials from Canada and competing nations as a potential source of both wealth and trouble.

Not all of Canada's vast claims to the Arctic are recognized internationally. The United States, the European Union and Denmark either contend that the region's waterways are open to all or have placed their own claims on parts where climate change is expected to increase access to the region's bountiful resources in coming years.

Diamond finds have already inspired a new mining rush, making Canada the world's third largest producer. Canada wants someday to tap natural gas in the Beaufort Sea in a frigid zone, bordering Alaska and Yukon Territory, which the United States tried to auction off to oil companies last year. The companies balked, preferring not to get mixed up in an international squabble.

Despite unusual challenges from Denmark, a NATO ally, Canada is also laying claim to an Arctic island with potential oil riches off its rocky shore.

Most important, climate change has begun to make more real the dream of opening a northwest passage that would shorten ship travel between Europe and Asia by thousands of miles, over the decades to come. Canadian policy makers want to reserve the right to regulate and tax such a passage.

"We used to forget that the Arctic was our border," Foreign Minister Pierre Pettigrew said in an interview. "There has been a change of perception of our reality, of where we belong."

But while Canada claims the region, it does not regularly patrol it. That is what Operation Narwhal was intended to remedy by making the military more comfortable operating in what can be an extreme environment and by allowing a sometimes mistrustful native population to get used to seeing Canadian troops and navy ships in Arctic waters.

For now, however, if nothing else, the exercise demonstrated that the military has a long way to go to operate effectively here.

Bad weather grounded air force planes and helicopters for days at a time, slowing troop transport even while commercial airlines kept flying. A small fire on a 40-year-old Sea King helicopter aboard the frigate Montreal hampered one exercise. Two soldiers got lost one night in the barren tundra and spent a night in a cave without survival gear.

But there were small victories, too, particularly in meshing the skills of the military and their Eskimo Ranger guides and improving relations with local residents, like Ms. Metuq and her children.

While the frigate, drones, a satellite and other patrols searched for the mock satellite debris, Tim Evic, a 45-year-old Eskimo Ranger, deciphered for Corporal Gale an otherwise inscrutable terrain where his boats could land, the intricacies of the fjord's tides, the spots where hunters and fishermen might cross and the places where patrols could find food and water.

But this is just the beginning of Canada's effort to increase its presence in the far north. Military officials have begun planning for a far more ambitious exercise in 2006 in Parry Channel, 500 miles north of the Arctic Circle.

The government has approved the launching of a satellite, Radarsat II, next year that will provide high-resolution surveillance across the Arctic to monitor the movement of surface ships. Military planners hope the satellite will work in tandem with pilotless aerial vehicles being tested during this year's exercises to see if they can provide useful intelligence despite the Arctic's low cloud cover.

Defense Minister Bill Graham noted that global warming had created "new possibilities and new threats" in the Arctic that Canada must adjust to.

"We need more resources up there and we are going to look for ways to deploy them," he said in an interview. "The sense is now the time has come."

Skeptics note, however, that even the new surveillance capacity will still not be able to detect the American, Russian, British and French nuclear submarines that periodically sail under the Arctic ice in waters claimed by Canada. Even if the submarines can be detected, the Canadian Navy does not have submarines or surface warships capable of operating in the high Arctic to do anything about it.

Seventeen years ago, the government of Brian Mulroney announced that it would buy 10 nuclear-powered submarines to prowl the disputed northern passages and upgrade five Arctic airfields to step up electronic reconnaissance flights. But the expansion was shelved in 1989 because of budget constraints.

"We have a habit of beginning northern security projects and abandoning them," noted Rob Huebert, associate director of the Center for Military and Strategic Studies at the University of Calgary.

But he said climate change, rising energy prices and increased security concerns seemed to be driving Canadian policy makers to take action.

"We're starting to get serious about surveillance in our Arctic," he added. "I finally see some action."

He compared Operation Narwhal to "baby steps" or "putting training wheels on a bike."

With the Liberal government struggling to improve health care, urban transportation and housing, however, there is little appetite in the House of Commons to significantly increase the $11 billion defense budget. The military is trying to stretch improvements on a shoestring and is staging exercises for symbolic impact.

One such operation was the "sovereignty patrol" undertaken by 20 regular Canadian troops and Eskimo Rangers in April. The patrol traveled between Resolute Bay, site of a research center on Cornwallis Island, and Alert, an outpost located at the northern end of Ellesmere Island on the Lincoln Sea. It was the longest and northernmost such operation in Canada's history.

Like these exercises, it also demonstrated both Canada's determination and its inadequate defense resources. Only five of the 16 mostly rented snowmobiles survived the treacherous 900-mile, two-week journey through the shifting ice and howling winds in working order. The five troopers who managed to complete the patrol hammered metal plaques into the tundra declaring Canada's sovereignty over the remote Arctic archipelago off the coast of northwest Greenland.

The patrol was Canada's response to an unlikely challenge from Denmark, which in two previous summers had landed marines from icecutting frigates on Hans Island, a desolate piece of rock in the Kennedy Channel, between Greenland and Ellesmere Island.

The Danes believed that the island and its surrounding waters had enough fishing and gas potential for them to pound Danish flags and plaques into its rocky surface and stir up a diplomatic incident that is still not settled.

Senior Canadian Defense and Foreign Ministry officials said the government viewed Hans Island as an important test case that could have repercussions for sovereignty claims along the entire Northwest Passage and the Beaufort Sea. ❑

Denmark: Move to Claim North Pole

New York Times, **"International," October 5, 2004, by Walter Gibbs**—Denmark plans to map the seabed north of Greenland, a Danish dependency, to see whether there is a geological case for claiming the North Pole for the Danish crown. Helge Sander, Denmark's science minister, said the $25-million expedition could lead to Danish control over potential oil and gas resources. Other countries with potential claims include Russia, Canada, Norway and the United States. ❑

Arctic Oil and Gas Digest

Assembled by Dave Norton, Arctic Editor

(Since the publication of the last issue of The Polar Times*, oil prices have hit new highs on world markets, deals have been made regarding what is known in Alaska as "stranded gas," and slightly more Congressional power has swung to Republican circles that favor drilling in the Arctic National Wildlife Refuge (ANWR). More quietly, development proceeds apace in National Petroleum Reserve-Alaska, and offshore oil and gas drilling plans are firmed up by other polar nations.)*

***NPR-A: Another Attack on the Arctic Opinion,* BARROW, Alaska, 8 July 2004, by Bruce Babbit**—Thwarted by the public in its efforts to open the Arctic National Wildlife Refuge (ANWR) to drilling, the Bush administration and the oil companies are now quietly turning their attention to the balance of the Arctic region of Alaska, all the way west to the Chukchi Sea, within sight of Siberia. In advance of its efforts, the administration has jettisoned environmental safeguards and is now threatening the traditional-use rights of the Alaska Natives who have hunted caribou and waterfowl along the Arctic slope for thousands of years.

This plan was announced in Anchorage just as Congress recessed for the Reagan funeral. Outside Alaska it has received little notice, not even for its centerpiece a proposal to lease rights for oil and gas development in Teshekpuk Lake, a body of water that is vital to the region. This shallow lake, which is about 30 miles across, is the biological heart of the western Arctic, the summer nesting and breeding ground for hundreds of thousands of black brant, spectacled eider, yellow-billed loons, white-fronted geese and other migratory birds that arrive here each year from 32 of the lower 48 states as well as countries as far south as Argentina.

The lake, however, isn't just for the birds. It is also a critically important subsistence area for the indigenous Iñupiat communities on the Arctic slope. They go there to hunt and fish for food to sustain them through the long, dark winters.

Teshekpuk Lake lies within the western region of what is known as the National Petroleum Reserve-Alaska (NPR-A). In 1976 Congress transferred the management of the petroleum reserve to the Bureau of Land Management. But Congress also mandated protections for the wildlife and native peoples, making it clear that America's Arctic should not be transformed into another West Texas oilfield.

In 1998 the Clinton administration took the first steps to open the reserve with a two-year study involving hundreds of scientists and representatives of the Iñupiat communities. Two years later the scientific teams returned with a recommendation to begin oil leasing, with stipulations for setting aside approximately 13 percent of the study area, mostly rivers and lakes, including Teshekpuk, as protected areas. They also recommended a ban on permanent roads across the fragile tundra, based upon assurances from the oil companies that they could operate with temporary winter "ice roads" that would simply melt away as summer approached and waterfowl and migratory caribou began congregating at the lake.

The Bush administration now proposes to eliminate these safeguards intended to protect the lake, the wildlife and the Iñupiat who depend on it. The decision is not yet final. During the summer there will be hearings in Anchorage and Washington. Then, Interior Secretary Gale Norton is expected to make a decision. In this land of endless summer days, there are bound to be a lot of sleepless nights. ❑

Bruce Babbitt was Secretary of the Interior in the Clinton Administration, from 1993 to 2001.

***Gas Line Measures Approved Fairbanks Daily News-Miner,* WASHINGTON, 12 October 2004, by Sam Bishop**—Two of Alaska's three major oil companies have offered cautious optimism about the potential for a North Slope natural gas pipeline under incentive packages approved Monday by Congress. The U.S. Senate passed a corporate tax bill with two gas line-related tax credits on a 69-17 vote. A separate military construction bill, which offers a federal construction loan guarantees and streamlines several regulatory processes, also passed by unanimous consent. The House passed the corporate tax bill Thursday 280-141 and the construction bill unanimously Saturday. Alaska's three members of Congress advocated or voted for passage of all the measures.

The major oil companies have some differences of opinion over whether the incentive package went far enough but they have all previously said the provisions that did pass are essential in themselves. Two company spokesmen Monday were reading off the same page, literally. Both Bob Davis, Exxon's spokesman in Houston, and Dave MacDowell, BP Amoco's Alaska natural gas spokesman in Anchorage, described the federal incentives as one leg of a "four-legged stool" necessary to support the line. The other three legs include technology improvements, an agreement with the state of Alaska and clear rules from Canada, Davis and MacDowell said.

The line is expected to cost about $20 billion. If the companies see four firm legs, MacDowell said, they can start designing the line and seeking government permits. Those two efforts will cost close to $1 billion, MacDowell said. Sen. Ted Stevens, R-Alaska, said Monday that he could see construction starting in two years, depending upon how the negotiations in Alaska and Canada progress. "If they decide there's too much delay, they'll move somewhere else," Stevens said.

Officials from the third company, ConocoPhillips, could not be reached Monday. In the past, they have said that the federal leg approved Monday, to be effective, had to be braced with a tax break when natural gas prices are very low. Now that Congress has left that idea in the waste basket, ConocoPhillips and the other companies must assess the line's viability. The three major North Slope gas owners already are negotiating as a group with Gov. Frank Murkowski's administration. The Legislature passed a law a few years ago allowing the executive branch to tinker with existing state tax rules to make a project more attractive for developers.

Two Canada-based pipeline companies, TransCanada Corp. and Enbridge Inc., are also negotiating under that law, said Mike Chambers, the governor's spokesman.

The gas owner companies and the pipeline companies all can haggle with the state over sales, corporate income and property tax rates, Chambers said. In addition, the three major North Slope operators, because they own the gas, can negotiate the share that the state collects as a royalty.

The Legislature must approve any agreement before it takes effect. Exxon's Davis said that his company is not necessarily seeking lower tax rates from the state of Alaska, just as it refrained from advocating any federal tax breaks. "We have not sought incentives, tax rebates or support for the project ... even in the state," Davis said. "That's been our historical position. It should be able to stand on its own. "We're concerned more with certainty. We wouldn't want to go into a project and then three or four years later the regime changes."

MacDowell said "passage of this language will allow us to focus on the state of Alaska fiscal negotiations." "The state fiscal discussion is all about the state take, if you will," MacDowell said. "The revenue stream, the royalty." But, like Davis, he emphasized the need for certainty: "What we're trying to achieve there is confirmation that the rules are clear, that everyone understands them and that the rules will last for the length of the project."

Asked if the disagreement with ConocoPhillips over the federal price-linked tax credit had any impact on the state talks, MacDowell said "we're all working together in our negotiations." MacDowell said the congressional action this week could also help shore up the third government-dependent leg. "We're hopeful that delivery of the U.S. federal legislation will help to encourage development of an efficient, traditional regulatory process in Canada," MacDowell said. By "efficient," he said, BP means a way to resolve aboriginal claims quickly. "Traditional,"

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he said, refers to the Canada National Energy Board's standard process for approving pipeline projects, not the process created in the 1970s for the failed Alaska Natural Gas Transportation System.

While the Alaska delegation stressed Saturday that the package they have put in place doesn't mandate a line through Canada, the major gas owners have said that's the most feasible option. However, two governmental organizations, the Alaska Natural Gas Development Authority and the Alaska Gas Line Port Authority, want to build a line to Valdez rather than through Canada. They have not submitted applications to the state and "there are questions about whether they need to," Chambers said.

For the owner companies, the fourth necessary leg is made up of technology-led cost reductions. Those include high-strength steel, automated welding machines and large trenching machines, MacDowell said last week. He said the group is "feeling pretty good" about those possibilities. Davis said the high-strength steel allows the pipe to be lighter, thereby reducing transportation costs.

Stevens said the line would demand virtually all the output from the world's steel mills for a year. Passing the legislation was important, he said, "to see if we could tie down the steel." It otherwise could go to tankers and plants used in the importation of liquefied natural gas from foreign countries. "I think it's going to be a real chore to find enough steel," he said. ❑

Congress Clears the Way for Construction of Alaska Natural Gas Pipeline, NGI Reports

***Business Wire*, STERLING, Va., 13 October, 2004**—A major step by the U.S. Congress toward ensuring long term natural gas supplies went virtually unnoticed this week as the departing lawmakers slipped an $18 billion loan guarantee and authorizations for a mega-natural gas pipeline from Alaska's North Slope to the lower 48 states into last-minute appropriations and tax measures, Natural Gas Intelligence reported.

The project to add 1,800 miles of pipeline to the already existing infrastructure to deliver 4.5 billion cubic feet a day (Bcf/d) to U.S. markets in the West and Midwest still has a long way to go, but the enabling measures approved Monday "provide us with what we need from the U.S. Congress for this project," Dave MacDowell, a spokesman for the Alaska operations of BP, one of the three major Alaska gas producers, told NGI.

The legislation provides the impetus for the project to gain sponsors, seek financing, complete engineering studies and pursue the necessary permits and authorizations along the pipeline route from north of the Arctic Circle, through Alaska, the Yukon and Alberta. Canadian pipeline operator and project proponent, TransCanada Corp., has said options are wide open for assembling a sponsor consortium that could include gas producers, other pipelines and aboriginal corporations participating in any or all of the pipeline construction. ❑

Record high oil price could lead to surplus in state coffers

***Associated Press*, ANCHORAGE, 15 October 2004**—Legislators could be dealing with a fat surplus if North Slope crude oil continues to average $41 per barrel. Chuck Logsdon, the state's chief petroleum economist, told the Anchorage Daily News the average oil price since July 1 is $41.23 a barrel, well above the $28.30 the state projected in the spring when state lawmakers passed a $2.3 billion general fund budget.

If the average oil price holds at that $41 average for the rest of the fiscal year, state lawmakers should have a surplus of about $840 million, Logsdon said.

"It's a lot of dough," Logsdon said. He cautioned that oil prices are unpredictable and easily could take a dive, even below the state's original $28 per barrel projection. The price of Alaska North Slope crude oil cracked $50 per barrel for the first time Thursday. North Slope crude delivered to West Coast markets closed at $50.44 per barrel, up $1.30 from the day before.

The latest in a string of record prices reflects continuing anxiety in global oil markets, rattled for months by the Iraq war, political tensions in other oil-producing countries and fears of supply shortages in the face of strong demand. The surge Thursday was triggered by a federal Energy Department report of a decline in the nation's inventory of heating oil.

While high oil prices are a drag on the overall U.S. economy, they are good news for the state general fund budget, which is made up mostly of taxes and royalties on North Slope crude oil. State budget director Cheryl Frasca, as well as some legislators, said a big surplus would be tantalizing but that the state must resist wild spending. Free spending during the early 1980s, when the state suddenly came into lots of oil cash, was followed by an oil price crash in 1986 that led to major economic pain, Frasca said.

A discussion is under way within state departments and agencies on how a surplus might be spent, Frasca said. One pressing need is money for deferred maintenance on roads, state buildings, prisons and schools, she said. All state departments are feeling a "pent-up demand" for more money after two years of tight or reduced budgets, she said. "We just have to be very careful about making wise decisions going forward," Frasca said.

State Sen. Gary Wilken, R-Fairbanks, a Finance Committee co-chairman, said Alaskans ought to be more grateful than gleeful about high oil prices. High energy prices are troubling for many, he said, including his own wholesale food distribution business. "We can rest assured we'll have a surplus of some amount, and it's probably counted in the hundreds of millions of dollars rather than the tens of millions," he said. "But I don't think, with this Legislature, you'll see a spending spree. Look back at the early '80s when we were flush with money and we went out and spent like drunken sailors. And then the economy crashed. I don't want to be part of that scenario."

Wilken said his priorities are to quickly pass a strong education budget bill next spring, pay back some of the billions of dollars borrowed in recent years from the Constitutional Budget Reserve and take care of deferred maintenance.

Rep. Les Gara, D-Anchorage, said the high oil prices ought to spur lawmakers to support his tax reform legislation so the state would rake in more when oil prices shoot up. "The state is cleaning up a little bit," he said. "The oil companies are cleaning up in record amounts." ❑

Bush Looking Anew for Alaska Oil Drilling

***Associated Press*, WASHINGTON, 9 November 2004, by H. Josef Hebert**—Republican gains in the Senate could give President Bush his best chance yet to achieve his No. 1 energy priority - opening an oil-rich but environmentally sensitive Alaska wildlife refuge to drilling.

If he is successful, it would be a stinging defeat for environmentalists and an energy triumph that eluded Bush his first four years in the White House. A broader agenda that includes reviving nuclear power, preventing blackouts and expanding oil and gas drilling in the Rockies will be more difficult to enact.

Republicans in the House and Senate said this week they plan to push for Alaska refuge drilling legislation early next year, and they predict success, given the 55-44-1 GOP Senate majority in the next Congress. Democrats and some environmental activists say continued protection of the refuge has never been as much in doubt.

"It's probably the best chance we've had," Rep. Richard Pombo, R-Calif., chairman of the House Resources Committee and a vocal drilling advocate, said in an interview.

Sen. Pete Domenici, R-N.M., chairman of the Senate Energy and Natural Resources Committee, said he will press to open the coastal plain of the Arctic National Wildlife Refuge (ANWR) as part of the government's budget deliberations early in 2005. That would enable drilling proponents to skirt an otherwise certain Democratic-led filibuster that would be difficult to overcome.

"With oil trading at nearly $50 a barrel, the case for ANWR is more compelling than ever," said Domenici. "We have the technology to develop oil without harming the environment and wildlife."

Bush is also expected in his second term to renew his call for action by Congress on a broader, largely pro-production, energy agenda—from easing rules for oil and gas drilling on federal land in the Rocky Mountains to expanding clean-coal technology and improving the reliability of the electricity grid.

New tax incentives to spur construction

The Thrill of Finding The World's Edge

New York Times, by Andrew C. Revkin—All the significant islands ringing the Arctic Ocean have long since been mapped. But off the northern coast of Greenland, where the near-permanent sea-ice cloak has been thinning, a succession of explorers has recently found small scraps of soil, each a few miles farther north than the last.

The first was Oodaaq, an island photographed, visited and charted in 1978 that has apparently vanished. A more northerly islet was found in 1996 by a team led by two Americans, Ken Zerbst and John Jancik.

The newest claim comes from Dennis Schmitt, a seasoned Arctic guide, linguist, and composer from Berkeley, Calif., and Dr. Frank Landsberger, an American physicist and entrepreneur who teaches at Cambridge University. Mr. Schmitt and others had seen something from the air on earlier visits, and last July he and Dr. Landsberger led a team over the ice, fording shallow lakes of meltwater and clambering over ice ridges until they stepped onto a 20-yard-long heap. The islet has not yet been recognized by Denmark, of which Greenland is a self-governing territory, but Mr. Schmitt said he was unconcerned about geopolitics.

For him, he said, the thrill is to find a new place. "All my life, there's been a transcendent element to finding something at the edge of the world," he said. "It's a heap of rock to some people, but a beautiful island by my standards of geography." ❑

Photo by Frank Landsberger

Last July, a team of explorers clambered over ice ridges to reach a heap of gravel off the north coast of Greenland that [they think] may be the northernmost bit of land in the world.

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of next-generation nuclear power plants also will be back on the table after Democrats and some moderate Republicans scuttled it last year. Greater use of corn-based ethanol in gasoline also has wide support at the White House and in Congress.

Drilling in the Alaska refuge has been all but dismissed as unachievable since drilling opponents two years ago beat back a pro-development measure by a 52-48 vote. Bush did not make an issue of the refuge during the presidential campaign.

But with four new GOP senators expected to support ANWR drilling and the loss of a Republican moderate who opposed it, drilling advocates believe they now have at least 52 votes in the Senate, enough to get the measure through Congress as part of the budget process. By Senate rules, opponents of drilling cannot filibuster a budget measure. ANWR qualifies as a budget measure because it will generate income for the government from oil companies.

Environmentalists already are gearing up to wage an intense lobbying campaign to keep oil rigs out of the refuge's coastal plain, a breeding ground for caribou, home to polar bears and musk oxen and site of an annual influx of millions of migratory birds.

"This is as serious a threat to the refuge as any that has come before," said Jim Waltman of the National Wildlife Federation. "But the facts haven't changed. This is still a magnificent area and it can still be damaged by oil drilling."

But geologists believe 11 billion barrels of oil lie beneath the refuge's tundra and ice, and drilling supporters contend they can be tapped without damage to the environment or wildlife.

Regardless the outcome in the Alaska refuge dispute, the path to getting a comprehensive energy bill is likely to be full of potholes. Twice in the last four years lawmakers have agreed on 85 percent or more of an energy package only to see final action derailed over narrow, although intensely contentious, issues.

Some lawmakers, including Sen. Jeff Bingaman of New Mexico, senior Democrat on the energy committee that will write the legislation, argue that lawmakers should focus instead on passing separate bills on the most urgent and widely supported measures.

Some of that already has occurred, such as the recently approved loan guarantees for a proposed $20 billion natural gas pipeline from Alaska to the lower 48 states.

Despite the GOP's new strength, Senate Democrats can still put the brakes on energy measures they strongly oppose through filibusters such as the one that blocked an energy bill in 2003. The issue then in dispute was liability protection for makers of the MTBE gasoline additives, which have been found to contaminate water systems.

However, given the stronger GOP majority, sustaining such filibusters may be more difficult. ❑

Obituaries

Editor's Note: *We became aware of Mortimer Turner's passing just as the last issue went to press and included a short obituary. Following is a more complete account of this well-known scientist's life and polar contributions.*

Mortimer D. Turner

Washington Post, **by Patricia Sullivan**—Mortimer D. Turner, 83, a geologist who helped open the Antarctic to scientific research and who oversaw Arctic research from the 1960 to the mid-1980s, died of a seizure May 1 in Boulder, Colo., where he lived.

Dr. Turner, program director for polar earth sciences for the National Science Foundation (NSF) in Washington, helped move polar research from geographic exploration into the broader science fields by advancing interest in the polar regions. He made 27 trips to Antarctica.

"His biggest impact on polar research was his work with his grantees," said his wife, JoAnne Church Turner, who worked with him. "Because the Antarctic had never been explored, it was important that grantees did not go only with their own project in mind, but that they go and see all kinds of science. He encouraged them to be broader in their thinking."

One young scientist, on a project launched by Dr. Turner, discovered a fossil of a lystrosaurus, a mammal-bite reptile previously found in South Africa, India and Australia. Because the animal could not cross fresh or salt water, its discovery in Antarctica was said to contribute to the proof of "continental drift," or the existence of Gondwanaland, the large continent that is theorized to have preceded the existence of Australia, Antarctica, India, South America and South Africa.

In 1968, Dr. Turner oversaw the first drilling project to completely penetrate the Antarctic ice sheet's core. The results from that study and from sediment drilling and meteorite collection projects allowed scientists to study evolution, earth structure and signs of global climate change in differing layers of the ice.

He was "gracious, generous, dignified and knowledgeable," said Guy Guthridge, the NSF's manager of Antarctic information in the Office of Polar Programs, who worked with him for 14 years. "For him, his investigators were his stars. He wanted them to get credit."

Dr. Turner was born in Greeley, Colo., and graduated from the University of California at Berkeley in 1943 with a bachelor's degree in geological engineering. During World War II, he served in the Army as a technician in the Ordnance Department. After his discharge, he spent three months as an engineer on missiles under Edwin Hubble at the Aberdeen Proving Ground.

He worked as a mining geologist at the California Division of Mines from 1948 to 1954, during which time he received a master's degree in geology from Berkeley. He went to Puerto Rico to serve as the state geologist. Five years later, he was recruited as assistant to the program director of the newly established U.S. Antarctic Research Program.

Dr. Turner received a doctorate in geology and metallurgical engineering from the University of Kansas in 1964. Upon his return to the NSF, he was given responsibility for the Arctic as well as the Antarctic. He published more than 70 scientific papers.

He retired in 1984 to do research in geology and early humans in Colorado, Montana and China. In 1987, he and JoAnne moved to Boulder to join University of Colorado's Institute of Arctic and Alpine Research. He also taught geology courses at University of Colorado at Denver.

The Turner Hills in Antarctica were named for him by the U.S. Board on Geographic Names. His name also adorns the mineral Turnerite from the Ice Free Valley area of south Victoria Land, a fossil of an Oligocene sirenian skull called *Caribosiren turneri* and a Cretaceous marine reptile fossil *Moturneria seymourrensis.*

The American Polar Society gave him its Career Service Award last year. In 1995, he received an award from the Center for the Study of the First Americans at Oregon State University for contributions to understanding America's earliest cultural heritage.

His wife of 20 years, Laura Perez Mendez, died in 1965. Survivors include his wife of 38 years, JoAnne Church Turner of Boulder, three children from the first marriage, Satia Goff of Monticello, Minn., Ylla Romdall of Bellingham, Wash., and Robert Turner of Bakersfield, Calif.; a stepson, Christopher Dort of Spotsylvania, Va.; six grandchildren; and three great-grandchildren. ❑

Kay Biery

Kay Biery, who worked in Antarctica from 1980 to 1996, the last 14 of those years as Director of Morale, Welfare and Recreation (MWR) for the Naval Support Force Antarctica (NSFA) at McMurdo Station, died 4 December 2004. She was 65.

"She really enjoyed that job," said her husband of 46 years, Roger. "She liked the people, she liked the continent. That's how Antarctica is—you don't really find people who are non-plussed about it. They either love it or they hate it. She loved it."

Roger was the first to work in Antarctica, having seen an ad seeking construction workers. After his first season in Antarctica, working as a foreman on the Williams Field construction project, "Kay thought that I'd been gone a little too long, so I told [the contractor] that I probably wouldn't be going back. They said, 'We probably have something for your wife.'"

Kay Biery started out as a Delta shuttle bus driver, then the following season found secretarial work at McMurdo. In 1982 she became MWR Director, a job which included supervising formal dinners for visiting dignitaries such as Britain's Prince Edward, New Zealand Governor-General David Beattie and senior U.S. government officials. She wintered over at McMurdo once.

Roger himself spent several more seasons in Antarctica. As a heavy equipment operator, he assisted with the 1986-87 recovery of Juliet Delta 321, a ski-equipped LC-130, from the nearly 10 meters of snow (a total of 65,000 cubic yards) that buried the plane after it crash-landed in December 1971, about 125 miles south of the French station Dumont d'Urville in East Antarctica.

Kay and her husband are lifetime members of the American Polar Society. She is also survived by a son, John; a daughter, Jayleen; and four grandsons, Jayson, Johan, Niklas and Skylor. Condolences can be sent to PO Box 564, Crestline, CA 92325. ❑

Gordon de Quetteville Robin

Gordon de Q. Robin, a leading figure in British polar research throughout the latter half of the 20th century, died 21 September 2004. He was 83.

Australian by birth, Robin graduated in physics at the University of Melbourne in 1942, thereafter joining the Royal Australian Navy and serving in a corvette. He later saw action on submarine duty in the closing stages of the war with Japan.

He joined the Falkland Islands Dependencies Survey for one year as a meteorologist in the South Orkney Islands. As base leader, his first task was to move the FIDS station from Laurie Island to Signy Island. Robin joined the Norwegian-British-Swedish Antarctic Expedition of 1949-52 and was responsible for studies of upper winds over Maudheim during two winters and seismic ice-depth sounding during summer expeditions inland. In 1958 he became the first full-time director of the Scott Polar Research Institute in Cambridge, England.

In the 1960s and 1970s, Robin was instrumental with others in conducting an airborne radio-echo sounding survey of the Antarctic ice sheet. Other contributions included the study of ice shelves; history of the Antarctic ice sheet; interaction between ice flow and sub-glacial topography; satellite radar altimetry; sub-glacial lakes (which he discovered in 1967); and the attenuation of ocean waves in pack ice.

Robin received many awards during his professional life, including the coveted Seligman Crystal of the International Glaciological Society. Signy Island's Robin Peak and Robin Heights in Antarctica's Queen Maud Land were named to honor him. ❑

Rose Howard

Rose Howard, widow of American Polar Society founder August Howard, died 2 August 2004 at 90.

Rose Howard assisted her husband with many aspects of publishing the early issues of the *Polar Times*, "in their own home and in their leisure hours," as Raimund E. Goerler and Lynn Lay described it in their article, "The American Polar Society: Past, Present And Future" (*Polar Times,* Fall-Winter 2003).

Mrs. Howard is survived by a son, Alan L. Howard, and a daughter, Doris Howard. ❑

Julian Peter Gudmundson

Julian P. Gudmundson, whose 30-year Navy career began with the creation of the Seabees in 1943, spanned World War II, Korea and Vietnam and included seven tours in Antarctica, died 12 August 2004 at 88.

Gudmundson, a Falls Church, Va., resident, was born August 1, 1916, in Lincoln Co., Minn., of Icelandic parents, Julius and Ingebjorg Gudmundson. He graduated high school in Ivanhoe, Minn., in 1934 and eloped with Dorothy Esther Bunning in 1938.

He was working as a carpenter when World War II broke out. When the Seabees were created in 1943, he volunteered. He worked on many Pacific islands and finished the war on Guadalcanal.

After WWII he went back to civilian life, but was called back to the Navy in 1951 with the outbreak of the Korean War. After that he stayed on in the Navy to ultimately retire after 30 years as the highest ranking Non-Commissioned Officer in the Navy in 1976.

Gudmundson volunteered for the Navy's first South Pole assignment in 1956 and spent two years building seven stations for the International Geophysical Year. While at McMurdo Sound Station, he supervised the construction of the first nuclear power station in Antarctic, then supervised its complete disassembly and removal after the U.S. signed a nuclear-free Antarctic Treaty. In 1967 he received a letter from the National Science Foundation that the U.S. Board on Geologic Names had named a mountain in Antarctica in his honor.

Gudmundson is survived by his wife of 66 years, Dorothy Gudmundson of Falls Church, Va., his son Julian P. Gudmundson, Jr. of Shoreview, Minn., his daughter Cynthia J. Donaldson of Falls Church, Va., five grandchildren and five great grandchildren. ❑

Membership Letter

The days are getting noticeably cooler and shorter here in downeast Maine, and my first months as American Polar Society membership chairman have passed in a whirl of activity. But I have learned a lot regarding the process of getting out dues reminders for the majority of our membership as well as updating addresses for two *Polar Times* mailings. Regarding dues notices, 786 pieces of mail went out in October at a tremendous cost of postage to the society. So please consider the idea of paying your memberships for multiple years to avoid yearly reminders and help us save on postage. By the middle of November, we had about 40 percent returned with dues payments.

Another big challenge has been keeping up with people's changing addresses. Having issues of the *Polar Times* returned to the membership center or new addresses forwarded to me costs the society quite a bit in postage to re-mail or track down members. So I would ask you to please send me a note, email or message when your address has changed to avoid incurring extra costs for the Society. Some of you have already done this, and we greatly appreciate it.

I also noticed as I was working with the database and printing out mailing labels (when I could) that there might be typos or incorrect spellings of names and/or addresses. Having enjoyed the name Lagerbom all my life, I appreciate it when it is spelled correctly, so please contact me if you discovered any erroneous or misspelled information with your mailings.

A lot of effort and expense also went into tracking down a number of members who had let their memberships lapse a year or two. A big "thank you" to those of you who keep up with the yearly dues and especially those who pay ahead in multiple years or have purchased lifetime memberships. This really does help. Another "thank you" goes to those members who have taken up my earlier challenge and have recruited others to join us in the APS. Our ranks are noticeably growing, and we appreciate your efforts! Please keep the challenge going and recruit someone who might like to become a member.

There appears to have been some confusion regarding the return cards from the *Polar Times*. To clarify, there are two types of returnable cards that come as an insert with the issues. One is for members to renew their memberships at a certain rate, and the other is an introductory offer with a special rate but only for *new* members.

I have really enjoyed the letters and notes from our many members and have come to appreciate the diverse membership of the Society. If you have ideas on how we can better serve our members, expedite the mass mailings, or increase our membership base, please do not hesitate to contact me through the membership center. And thank you to everyone who has helped me come to grips with this chairman position!

Charles Lagerbom

New APS Life Members 2004

Alspach, Tom (June 2004)
Stoyles, Amy (October 2004)
Stewart, Martha (November 2004)
Kokoris, Moki (December 2004)

Members In Remembrance 2004

Austin, Fred (03/04)
Britton, Maxwell E. (2004)
Frankiewicz, CDR Edward J. (05/09/04)
Gudmundson, Julian P. (08/12/04)
Hughes, Jerry G. (10/06/04)
Lockhart, Richard (03/03)
Mills, William (05/08/04)*
Pool, Beekman (04/04)
Siple, Ruth (01/23/04)
Sutcliffe, Thomas (2002)
Thomas, Don (01/22/04)
Turner, Morton D. (05/01/04)
Wiley, Robert J. Sr. (04/04/03)
*Friend of APS

New Members (as of 11/24/04)

Arnold-Berkovits, Edward (Maplewood, NJ)
Aultman, Mims C. (Washington, DC)
Bacon, Mark D. (Anchorage, AK)
Berube. John (Portsmouth, NH)
Bjella, Kevin (White River Junction, VT)
Boggess, Thomas F. (Iowa City, IA)
Bradbury, Clive (Cambridge, ENGLAND)
Bugayer, Joe (Seattle, WA)
Fathauer, Ted (Fairbanks, AK)
Foerstner, Abigail (Wilmette. IL)
Galindez, E. (Mobile, AL)
Georgia Periodontics P.C. (Atlanta, GA)
Gurnett, Donald (Iowa City. IA)
Heideman, Kathleen (Minneapolis, MN)
Lebar, Don (Madison, WI)
Marchant, Sarah & David (Reading, MA)
Matejczyk, David M. (Seville, OH)
Maxson, Linda (Iowa City, IA)
Methodist Manor House Library (Seaford, DE)
Murray, George C. (Windsor, VT)
Ortega, Miguel (Guanajudto, MEXICO)
Schaut, Mr. & Mrs. Norman F. (Ocean City, NJ)
Schneider, Joseph (Tarzana, CA)
Shulman, Leonard M. (Newark, DE)
Stevens, Christine (Iowa City, IA)
Taylor, David (South Thomaston, ME)
Walder, Dr.& Mrs. Charles (Baltimore, MD)
Weller, Gunter (Foster, Australia)
Wright, Harold (Plymouth, WI)
Stewart, Lawrence (Pacific Palisades, CA)
Bucher, Jerry (Laramie, WY)
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Purpose of APS

"The purpose of the American Polar Society is to bring together people interested in research and exploration in the Arctic and Antarctic; to preserve the record of polar research and exploration; and to support and encourage research and exploration in polar and polar-like regions. Toward these ends, the Society will collect and disseminate information about polar regions; compile written records, oral histories, maps, photographs, film and video, and electronic information relating to polar regions; aid organizers and members of polar expeditions; and maintain contact with scientists, explorers, research institutions and interested parties." ❑

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ABOUT OUR BACK COVER

Vacation photographer Judy Bristow of Kaysville, Utah, had her camera pointed in the right direction this last July when, during an Alaskan cruise with her husband, Terry, they observed a panoramic view of Eagle Glacier (top photo) and the unforgettable sight of the Hubbard Glacier (lower photo) as it calved a "small" iceberg!